ARMY RESEARCH LABORATORY

Future Force Warrior: Insights From Air Assault Expeditionary Force Assessment

by Daniel D. Turner and Christian B. Carstens

ARL-TR-4191 **July 2007**

NOTICES

Disclaimers

The findings in this report are not to be construed as an official Department of the Army position unless so designated by other authorized documents.

Citation of manufacturer's or trade names does not constitute an official endorsement or approval of the use thereof.

DESTRUCTION NOTICE—Destroy this report when it is no longer needed. Do no return it to the originator.

Army Research Laboratory
Aberdeen Proving Ground, MD 21005-5425

ARL-TR-4191 **July 2007**

Future Force Warrior: Insights From Air Assault Expeditionary Force Assessment

Daniel D. Turner and Christian B. Carstens
Human Research and Engineering Directorate, ARL

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. REPORT DATE *(DD-MM-YYYY)*	2. REPORT TYPE	3. DATES COVERED (From - To)
July 2007	Final	

4. TITLE AND SUBTITLE
Future Force Warrior: Insights From Air Assault Expeditionary Force Assessment

5a. CONTRACT NUMBER

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER

6. AUTHOR(S)
Daniel D. Turner and Christian B. Carstens (both of ARL)

5d. PROJECT NUMBER
62716AH70

5e. TASK NUMBER

5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
U.S. Army Research Laboratory
Human Research and Engineering Directorate
Aberdeen Proving Ground, MD 21005-5425

8. PERFORMING ORGANIZATION REPORT NUMBER
ARL-TR-4191

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

10. SPONSOR/MONITOR'S ACRONYM(S)

11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution is unlimited.

13. SUPPLEMENTARY NOTES

14. ABSTRACT
Future Force Warrior (FFW) Soldier ensembles were evaluated during the Air Assault Expeditionary Force experiment conducted at Fort Benning, Georgia, in the fall of 2006. One nine-man squad of infantry Soldiers was equipped with the Soldier or Leader variation of the FFW system. Each system included the FFW uniform and helmet, body armor chassis, global positioning system tracking receivers, radio communication equipment, a computer system with operating software, and voice-activated controls. In addition, the Leader systems included laser range finding devices and associated software. The ensembles contained a goggle-mounted visual display or a personal digital assistant display. The Soldiers received extensive hands-on training in a variety of tactical contexts, including mission planning, land navigation, laser target designation, ambush, reconnaissance, and defense. Following training, the Soldiers participated in multiple offensive and defensive scenarios that were conducted during the day and night. Questionnaires concerning the form, fit, and function of the FFW components were administered after each exercise and at the end of the assessment. The results show that the FFW systems were very well received by the test Soldiers. They strongly preferred the FFW equipment to their baseline gear for virtually every activity in every scenario. They especially liked the capability to maintain radio contact with squad members, the ease of mission planning and land navigation, the ease of learning and operating the software packages, and the situational awareness afforded by the system. The Soldiers had very positive evaluations of the FFW uniforms and helmets, and they liked the load-carrying capacity and comfort of the body armor chassis. Problems were encountered with some of the system components. The voice-activated controls were difficult to use if the Soldier was breathing heavily, and the controls did not work well for Soldiers who had heavy accents. The goggle-mounted displays seemed to interfere with the use of monocular night vision devices, and there were problems with the mounting system. Soldiers noted several problems with the icon displays. Suggestions were made for improving the system.

15. SUBJECT TERMS
AAEF; FFW

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			Daniel D. Turner
Unclassified	Unclassified	Unclassified	SAR	150	19b. TELEPHONE NUMBER (*Include area code*) 706-545-5634

Contents

List of Figures

List of Tables

1. Introduction

The Future Force Warrior (FFW) program management team provided one squad of the experimental platoon in the Air Assault Expeditionary Force (AAEF) experiment at Fort Benning, Georgia, with complete FFW ensembles and working electronics. Although the structure of the AAEF experiment did not allow access to the squad during the conduct of the formal experiment, the FFW team did collect form, fit, function, and operational use data from the squad after each of the FFW training, FFW pilot test, and AAEF experiment days. Another questionnaire was administered at the completion of the entire experiment.

1.1 Background

The AAEF series of live field experiments, using platoon- and company-size units, is being conducted at Fort Benning during the 2003 to 2007 time frame. The AAEF is the principal prototype discovery experiment in the U.S. Army Training and Doctrine Command. It is designed to enhance risk reduction for the Future Combat System (FCS). This year was the third (spiral C) of the series, and the test unit was an infantry platoon. These experiments are a simulation wrap-around and include

- Joint conflict and tactical simulation to replicate the remainder of the brigade combat team down to the entity level;
- Fire simulation (FireSim) to replicate Army and joint effects, including 120-mm mortar, 105-mm precision guided round, and non-line-of-sight launcher system, precision attack munition, and joint strike fighter;
- Urban and complex terrain;
- Day and night operations;
- Attack, defend, critical node missions;
- Live air assaults;
- Experiment design supports a base case initial brigade combat team (IBCT) and an advanced concept case (IBCT with FCS-like enablers and enhanced command, control, communication, computers, intelligence, reconnaissance, and surveillance [C4ISR]);
- 2014 time frame, southwest Asian environment.

The AAEF advanced concept structure contains

- Enhanced communications, situational awareness (SA), and planning tools that can transmit voice and data (Soldier radio, force 21 battle command brigade and below [FBCB2], FFW, and sense-through-the-wall technology);

- Terrestrial, air, and space-based nodes enhance reliability and provide redundancy (sensor exploitation and management system, airship, satellite communications, buster);
- Multiple sensor platforms, including unmanned aerial vehicles (UAVs), unmanned ground vehicles, and unmanned ground sensor feed the common operational picture (Raven, Buster, Nighthawk, Special Weapons Observation Reconnaissance Detection System, Spider, PackBot, unattended ground sensors);
- Surrogate vehicles provide enhanced maneuverability on the battlefield (high mobility multipurpose wheeled vehicle [HMMWV], hybrid electric HMMWV);
- Vertical maneuver coupled with on-board planning and SA tools enable tactical operations to operational distances (UH-60 with command and control [C2] stations, V-6 tablet, Soldier radio, Marine CH-53E).

The AAEF hopes to accomplish the following for the Army:

- Continue experimentation with emerging technologies in a live field environment in order to inform FCS:
  - Provide doctrine, organization, training, leader development, materiel, and Soldier insights to assist in FCS risk reduction decisions;
  - Refine the user functional description for FCS battle command;
- Provide a live venue to identify promising technology candidates for Spiral C to the current force;
- Assess and document the impact of emerging C4ISR (and other technologies) and tactical vertical maneuver concepts on the lethality and survivability of a small modular combat unit;
- Explore the C4ISR challenges and requirements of employing an FCS-like network;
- Refine capability requirements for a network-enabled force to dominate its battle space (identify capability gaps);
- Address employment of sensors and sensor management at the small unit level.

1.2 Purpose of Assessment

The purpose was to collect data from the FFW squad on their assessment of the system while participating as a squad in the AAEF experiment, as well as form, fit, function, and suitability of the FFW ensemble and electronics.

2. Procedures and Methodology

2.1 Overview

The FFW Soldiers participated in three phases of the FFW assessment: training, pilot exercises, and the formal AAEF exercise. It is important to keep in mind that this current assessment of FFW equipment was "piggy-backed" on the AAEF experiment. As such, the FFW personnel were only given access to the Soldiers on a limited basis daily. The data collection, in the form of questionnaires, was accomplished on a non-interference basis and was done at the end of each test day during the training, pilot, and conduct of the AAEF experiment. This was the only method available to gather data for our assessment of the FFW.

2.2 Participants

The participants were Soldiers from the 1/29th Infantry. The FFW squad was the second squad of the platoon. All Soldiers were fully trained in the field of infantry and held the military occupational specialty (MOS) of 11B. The FFW team briefed the Soldiers about each phase of the assessment and what was expected of them. The assessment did not require the Soldiers to do any tasks that are not normally a part of their daily infantry tasks, and they were always accompanied by senior noncommissioned officer (NCO) instructors.

2.3 System Description

The FFW system consisted of two variations: the leader (worn by the squad leader, two team leaders, and two grenadiers) and the Soldier (worn by two automatic riflemen and two riflemen). Throughout the experiment, the Soldiers were asked to compare the FFW system with their current equipment worn in training and combat. This was referred to as the "baseline". The Soldiers relied on their memory to make this comparison, but it is believed to be adequate since all Soldiers were involved on a daily basis in training with the baseline system.

2.3.1 System Components Shared by All

- Multi-function combat suit (MFCS)
- Soldier protection integrated ensemble system (SPIES) chassis
- SPIES ballistic load belt
- Hydration system
- Push-to-talk and body-worn antenna
- Global positioning system (GPS)

- Wearable Soldier radio terminal
- Computer
- Trackball mouse
- FFW helmet

2.3.1.1 Multi-Function Combat Suit (MFCS)

The MFCS had the multi-cam camouflage pattern and integrated knee and elbow pads. The test shirt had upper arm pockets were secured with a hook and loop fastener. Furthermore, participants wore shirts with cotton knit torso material. The MFCS shirt and pants are shown in figures 1 and 2.

Figure 1. MFCS shirt.

Figure 2. MFCS pants.

2.3.1.2 SPIES Chassis

The SPIES chassis was an integrated body armor and load carriage system. During AAEF, the chassis housed the front and back protective training plates. (The training plates are the same size, shape, and weight of the ballistic inserts without the ballistic protection properties.) All test-related electronics and hardware were stored in pockets and secured to the chassis via modular lightweight load-carrying equipment straps. Figure 3 shows the SPIES chassis.

Figure 3. SPIES chassis.

2.3.1.3 SPIES Ballistic Load Belt

The SPIES ballistic load belt was used by the participants to carry additional mission-critical items. The version worn during testing had an adjustment strap that ran the length of the belt. Two users also wore suspenders to keep the loaded belt from slipping. Figure 4 shows the ballistic load belt.

Figure 4. Ballistic load belt.

2.3.1.4 Hydration System

The hydration system enabled the Soldiers to carry water while they were moving. During testing, the hydration system was attached to the right of the back plate carrier. Figure 5 shows the hydration system attached to the right rear side of the chassis.

Figure 5. Hydration system.

2.3.1.5 Push-to-Talk and Body-Worn Antenna

The push-to-talk (PTT) enabled the wearer to communicate with the squad leader. During testing, the PTT was worn just to the front side of the left shoulder. The body-worn antenna was a differential plate type that enabled robust narrowband and wideband communications capability. The antenna had two connected pieces, and each piece was housed in a ballistic (training) plate carrier. During testing, the antenna was placed in front of the plates. Figure 6 shows the configuration of the PTT and the body-worn antenna.

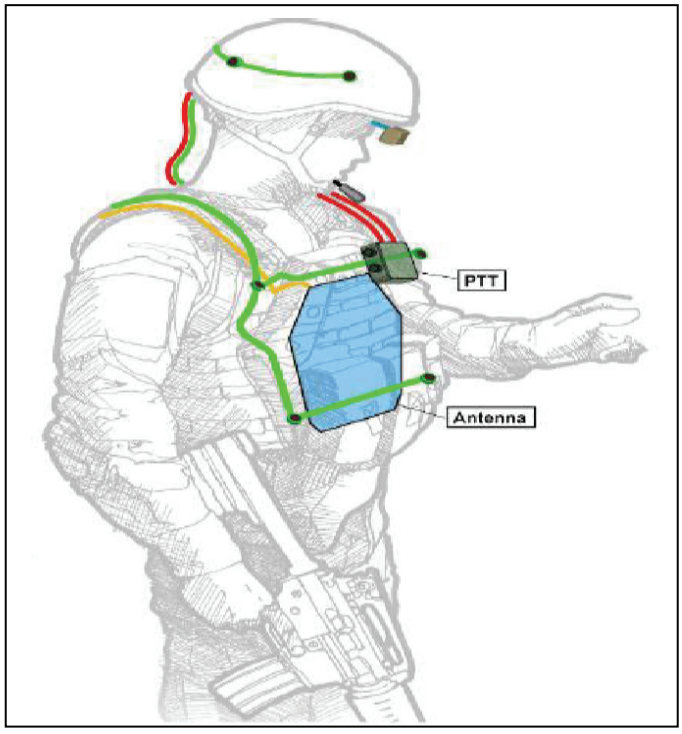


Figure 6. Push-to-talk and body-worn antenna.

2.3.1.6 Global Positioning System (GPS)

The FFW system GPS receiver captured satellite data on the wearer's coordinates. During testing, the GPS receiver was worn just to the back side of the left shoulder.

2.3.1.7 Wearable Soldier Radio Terminal (WSRT)

The WSRT ran the Soldier radio waveform which established the communications network connectivity within the FFW squad and to higher elements. The WSRT was used to send SA and C2 data as well as voice communications within the squad. During testing, the WSRT was stored in a pouch just behind the Soldier's left arm. The WSRT is shown in figure 7.

Figure 7. Wearable Soldier radio terminal.

2.3.1.8 Computer

The computer was used to process the squad GPS data and the XM-104/multi-functional laser (MFL) data in the FalconView[1] software package. The computer was housed within the computer carrier on the rear of the chassis.

2.3.1.9 Trackball Mouse

The trackball mouse was used to manipulate the Bare Bones and FalconView software that appears in the goggle-mounted display. The mouse was carried in a pouch, typically situated on the right-hand side of the chassis. The trackball mouse is shown in figure 8.

[1]FalconView is a trademark of Georgia Tech Research Institute.

Figure 8. Trackball mouse.

2.3.1.10 FFW Helmet

The FFW helmet system provided ballistic and impact protection, as well as communication and mounting functions. Two bone conduction speakers were used to enhance communications when Soldiers were in the field. There was one bone conductor on each side of the FFW helmet. There was a boom microphone for voice communications, and a centrally placed night vision goggle (NVG) mounting point was provided atop the FFW helmet to provide hands-off enhanced vision during low light or nighttime conditions.

2.3.2 Soldier Components

- Personal digital assistant
- Lithium-ion battery
- Soldier system headgear
- C2 mobile intelligent network-centric computing system (MINCS) Soldier software

2.3.2.1 Personal Digital Assistant (PDA)

The Recon 400 X, commercially available, hardened PDA provided SA to the Soldier via Government-owned C2 MINCS software. During testing, the PDA was stored in a pouch on the left-hand side of the chassis just under the Soldier's left arm. Figure 9 shows the PDA.

Figure 9. Personal digital assistant.

2.3.2.2 Lithium-ion (Li-Ion) Battery

The PDA had its own Li-Ion battery, which was attached to the bottom of the unit. The PDA battery lasted 10 to 12 hours. The base Soldier system used two BB-2590/U rechargeable lithium-ion batteries to power the WSRT and GPS. Both BB-2590/U batteries lasted more than 12 hours during testing and were stored in one pouch below the assault pack. The location of some of these electronic components is shown in figure 10.

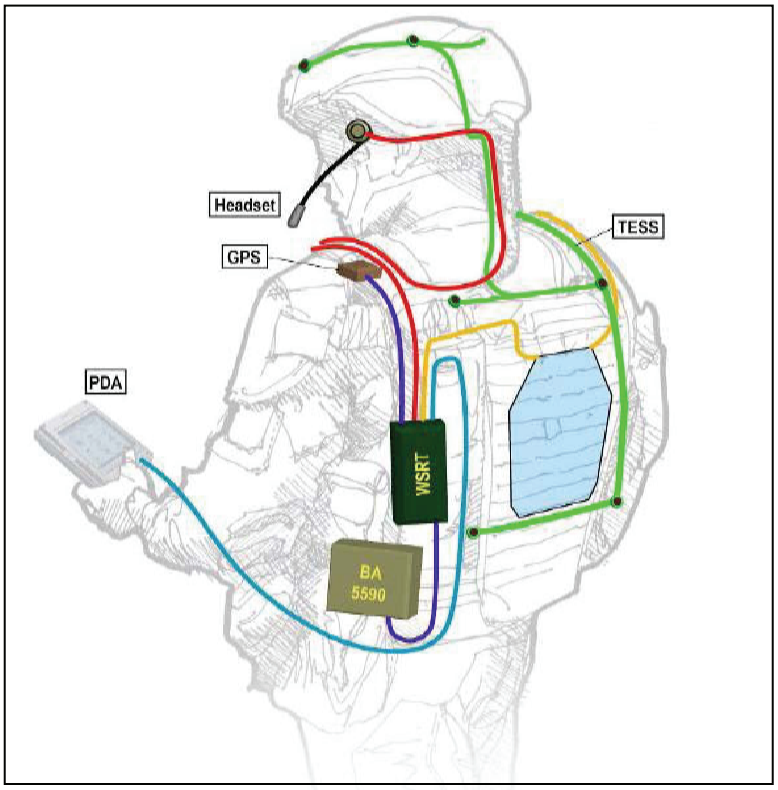


Figure 10. SPIES chassis-worn components – Soldier configuration.

2.3.2.3 Soldier System Headgear

One microphone extended off the Soldier system FFW helmet. Two bone conduction speakers were attached to the supporting strap within the Soldier helmet. These speakers rested on the temples of the user and provided incoming voice messages without interfering with the Soldier's ambient hearing. The configuration of the Soldier system headgear is shown in figure 11.

Figure 11. FFW Soldier system headgear.

2.3.2.4 C2 MINCS Soldier Software

C2 MINCS is a dismounted mobile computing platform designed to provide Soldiers with network-centric C4ISR connectivity. It was intended to operate as part of a tactical SA network, as a stand-alone unit, or to augment the capabilities of the FBCB2 to dismounted war fighters. It provided dismounted war fighters with continuous real-time SA of friendly locations, tactical report genera-tion, capability to communicate with higher echelons, memory joggers, and integration with MFL for target transfer. The C2 MINCS was used by the riflemen and the automatic riflemen in the squad. A sample of the C2 MINCS display is shown in figure 12.

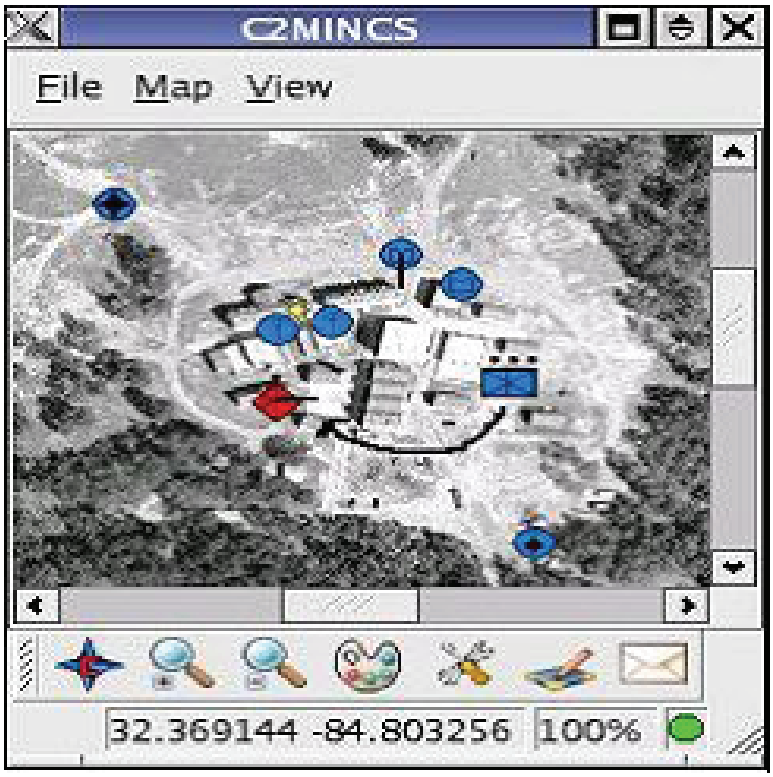


Figure 12. C2 MINCS Soldier software window (sample).

2.3.3 Leader Components

- Leader computer
- Multi-function laser (MFL)
- XM-104
- Rechargeable lithium-ion battery (2)
- Battlefield renewable integrated tactical energy system (BRITES) power manager
- Leader computer (CF18 Toughbook)
- Leader system headgear
- FalconView leader software
- Trackball mouse

2.3.3.1 Leader Computer

The leader computer was used to process the squad GPS data and the XM-104/MFL data in the Bare Bones and FalconView software packages. The computer was housed within the computer carrier on the rear of the chassis.

2.3.3.2 Multi-Function Laser (squad leader and rifleman only)

The MFL system, which was designed to enhance target engagement, was attached to the Soldier's weapon and to the PDA or leader computer (CF-18) to enable aim point and import/export of target information across the network via C2 MINCS. The leader configuration is shown in figures 13 and 14. (During this experiment, the MFL was used by the squad leader and one rifleman only.)

2.3.3.3 XM-104 (grenadier only)

The FFW-modified XM-104 fire control system was designed to enhance target engagement during cooperative engagements. This device connected to the leader computer (CF-18). It enabled aim point and import/export of target information across the network.

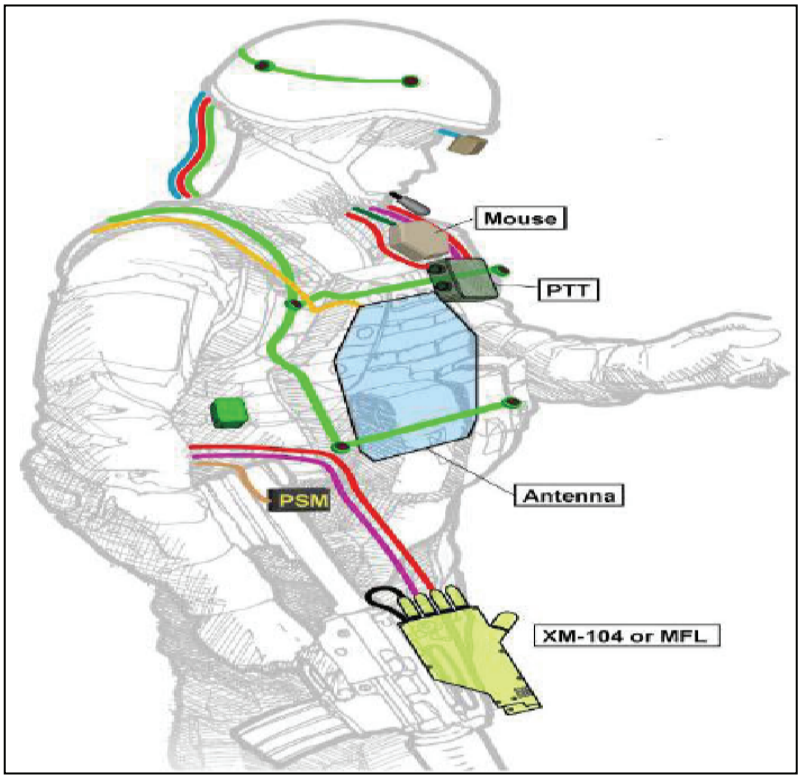


Figure 13. Leader configuration (front).

2.3.3.4 Rechargeable Lithium-ion Battery (worn on back)

The leader system used a BB-2590/U rechargeable lithium-ion battery to power the WSRT, GPS, and computer. A second battery was used as a back-up. Both batteries lasted about 12 hours during testing. One battery was stored in the leader's computer carrier, while the other was stored in a pouch just behind the Soldier's right arm.

2.3.3.5 Battlefield Renewable Integrated Tactical Energy System (BRITES) (worn on back)

The BRITES power management system managed the power consumption of the two BB-2590U batteries by the electronics.

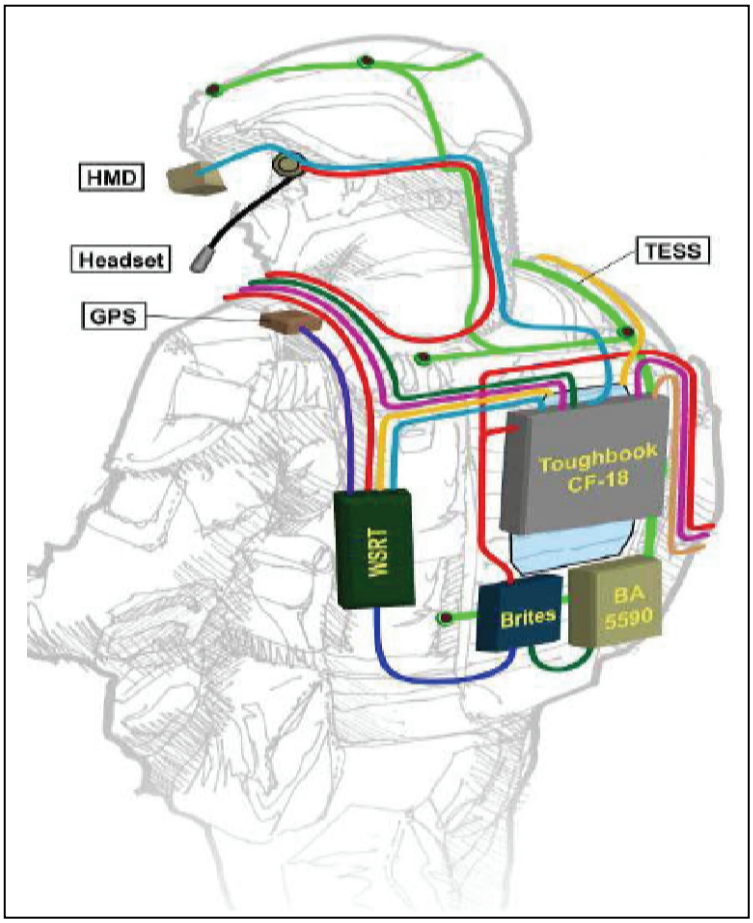


Figure 14. Leader configuration (back).

2.3.3.6 Leader Computer (CF-18 Toughbook)

The leader computer consisted of a Panasonic CF-18 Toughbook computer. The leader computer resided in the backpack chassis of the leader system. The leader computer provided all of the processing and hardware to run the FalconView leader software. The leader computer connected to the goggle-mounted display (GMD) and trackball mouse in order for Soldiers to interface with the FalconView software.

2.3.3.7 Leader System Headgear

Two parallel-mounted microphones extended off the leader system FFW helmet. One microphone was used for hands-free communication. The second microphone, included in the leader system, was used to issue verbal commands to the FalconView and Bare Bones software programs.

A multi-functional color GMD displayed tactical processor information. For clarification purposes, the GMD is referred to as the "display," and the sun, wind, dust (SWD) goggle is referred to as the "goggle".

2.3.3.8 FalconView Leader Software

FalconView is a Government-owned Microsoft Windows[2]-based mapping application that displays various types of maps and geographically referenced overlays. It was intended to operate in a tactical network as a stand-alone unit or to augment the capabilities of the FBCB2 for dismounted war fighters. It provided the dismounted war fighters with continuous real-time SA of friendly locations, tactical report generation, communications capabilities with higher echelons, UAV aero-environment controls, system voice control, Bare Bones targeting system, route planner, and memory joggers.

In the Baseline configuration, the FalconView software was loaded onto a tablet with the Windows operating system. It was interoperable with FBCB2 and was multiple map and imagery capable. For FFW AAEF use, it was intended for the squad leader, team leaders, and the grenadiers.

A sample of the FalconView display is shown in figure 15.

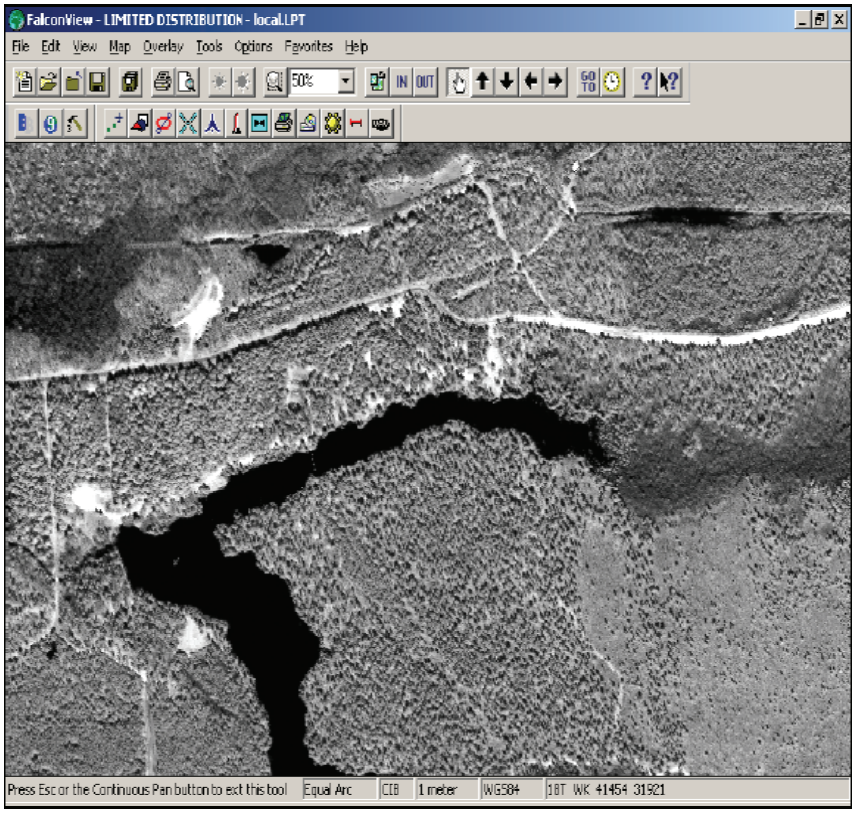


Figure 15. FalconView window (sample).

[2]Windows is a trademark of Microsoft Corporation.

2.3.3.9 Trackball Mouse

The trackball mouse was used to manipulate the Bare Bones and FalconView software that appears in the GMD. The mouse was carried in a pouch, typically situated on the right-hand side of the chassis. The trackball mouse is shown in figure 8.

2.4 Methodology

2.4.1 Demographics

The squad members were assigned roster numbers 1 through 9 and were given an overview of the planned training activities. They were then administered a demographics questionnaire that was designed to elicit information concerning their experience, physical characteristics, and training. Select anthropometric data were measured by the AAEF team and used by the FFW team to size uniforms and by ARL to assess key issues with clothing and equipment.

2.4.2 Training

The FFW squad reported to the FFW team location to be fitted and trained on the FFW system. Table 1 shows the training segments taught in the training phase. After initial training, the Soldiers received practical field exercises with each segment. The squad was trained by senior NCOs from the Natick Soldier Center, Massachusetts. During the training phase, emphasis was placed on hands-on training. The Soldiers were encouraged to experiment with their FFW systems to better understand the operational characteristics. Throughout this training, the two senior NCOs from Natick closely supervised all activities in the classroom and during the field exercises.

Table 1. FFW system training segments.

Initial Training
Land Navigation, Route Planning and Waypoints
Night Ambush
Training and use of Lasers
Recon and Defense
Mission Planning and Troubleshooting

At the end of each segment of the training phase, the Soldiers were administered questionnaires to solicit information about their confidence with the training and their abilities to complete the tasks assigned. Complete responses to each questionnaire are provided in appendices A through G.

2.4.3 Post-Training Support Staff Activities

At the completion of the training phase, a questionnaire was given to all of the engineer and support staff from the FFW team to solicit information about the maintainability and other logistical aspects of keeping the FFW systems in a “ready” status. Most of these personnel were involved on a daily basis with preparing the FFW systems for use. The complete list of questions and responses is given in appendix H.

2.4.4 Pilot Test

At the completion of the training phase and before the assessment started, the AAEF directorate conducted a two-day pilot test. This event was designed to rehearse the data collection events and ensure that the systems were working properly. The pilot test consisted of two attack missions on two consecutive days. The FFW team collected data using questionnaires on these two days during the time allotted by the AAEF team. The responses to the questionnaires for the pilot test are shown in appendix I.

2.4.5 Assessment

The AAEF experiment consisted of multiple offensive and defensive scenarios that were conducted during day and night. For ease of data analysis, the FFW data were collected via two questionnaires, one for offensive operations and one for defensive operations. The data from both day and night were consolidated into these offense and defense questionnaires. Table 2 shows the schedule of mission types conducted during the AAEF experiment. A complete list of questions and responses is presented in appendices J and K.

Table 2. Assessment scenarios.

Day Attack	**Day Defense**
10/23/2006	10/25/2006
10/26/2006	10/27/2006
11/2/2006	11/1/2006
11/3/2006	
Night Attack	**Night Defense**
10/24/2006	10/31/2006
10/30/2006	11/6/2006
11/7/2006	
11/8/2006	

2.4.6 Post-Assessment Evaluations

At the completion of the assessment, a detailed questionnaire was administered to the FFW squad to solicit information about form, fit, function, and usability of the FFW system they had worn and used during the assessment. The complete list of questions and the responses is given in appendix L.

3. Results

3.1 Demographics

The test Soldiers ranged in rank from E-1 to E-6, with a mean time in service of 7.4 years. Eight Soldiers were right-handed and one was left-handed. All had an MOS of 11B. Seven of the Soldiers had combat experience. All Soldiers reported a high level of competence in the individual ratings of their infantry tactics, techniques, and procedure skills.

As shown in table 3, the participants (all male) ranged in height from the 13th to the 93rd percentile and in weight from the 8th to the 99th percentile.

Table 3. Height and weight of participants (N = 9).

Roster	Height (in.)	Percentile ht	Weight (lb)	Percentile wt
1	73	93	195	83
2	72	86	244	99
3	71	76	180	65
4	69	50	160	31
5	68	35	174	55
6	71	76	164	39
7	66	13	140	8
8	72	86	225	97
9	71	76	165	40

Complete demographic data are shown in appendix A.

3.2 Training Phase

3.2.1 Initial Training Segment

During the initial training segment, most of the Soldiers reported no problems in assembling and donning the FFW ensemble. The Soldiers reported no difficulty in connecting the cables that powered the radios and other electrical components.

As a general rule, training in the operation of the software and the electrical components proceeded without any major difficulties. The Soldiers had some problems in learning to use the GPS system. In some cases, the GPS did not work. Additionally, there was some difficulty in interpreting the icons on the visual display because of the non-standard formatting of the non-military-based system. This was overcome as the Soldiers adjusted to the civilian format.

The Soldiers expressed some concerns about the goggles that were used to mount the display. One Soldier said that the goggles were not compatible with his glasses. He continued to use the goggles with his glasses but with difficulty and degradation. There was no way to modify the goggle to

address this issue during this experiment. Another commented that the individual Soldier should be able to adjust which eye has the display.

The Soldiers had no trouble learning to operate the XM-104 and the MFL.

3.2.2 Land Navigation, Route Planning, and Waypoints Segment

In general, Soldiers found that land navigation was much easier with the FFW equipment than with a compass and map. They found the automated navigation of the FFW to be much easier than the stop, orient, read, and assess method used with map and compass. There were some problems with the GPS receivers working intermittently. When the GPS receiver was working, latency in the icon updates was sometimes several minutes, rather than a real-time display of current conditions. There was also a problem with the GPS working inside buildings.

There was a problem with the two wires connected to the back of the helmet getting caught in vegetation during movement. The Soldiers liked moving cross country with the FFW body armor chassis. They found that the FFW chassis was more comfortable, allowed for easier torso movement, and did not restrict their movement as much as their baseline system. The combination of the stand-off in the chassis and the moisture-wicking capability of the shirt minimized heat accumulation.

All the Soldiers were able to use the voice control system, but it was difficult to use when the Soldier was breathing hard after exertion or when he was in contact with the opposing forces. Some Soldiers thought that the route-planning software should be included in the Soldier system as well as the leader system. The point was made that all Soldiers at any given time may have to navigate or may be called upon to plan routes or alternate routes.

3.2.3 Night Ambush Segment

For the most part, the Soldiers had no major problems, except for the display, in completing the required tasks while wearing and using the FFW equipment. It was difficult for Soldiers to move over rough terrain at night while wearing the goggles with the display and the Army-Navy/portable vision search (AN/PVS)-14 NVGs. The goggles fogged and interfered with vision.

Some were concerned that the PDA emitted enough light to compromise their position even when the brightness was set to the lowest level. However, the Soldiers reported no problems with light emissions compromising their positions from the display used with the goggles.

The Soldiers liked having the entire squad connected by radio. This enhanced their individual SA and was especially helpful when the mission plan needed to be changed. SA was sometimes hampered by the slow refresh rate of the icons.

Some Soldiers suggested that the system could be improved if topographical maps were included in the software and if the map could zoom down to a finer resolution.

3.2.4 Training and Use of Laser Segment

The Soldiers encountered no major difficulties in learning to operate the laser devices or in working with the targeting information. They liked having the ability to accurately designate a target from a relatively safe distance.

All Soldiers said that both the MFL and the XM-104 were easy to use and that they would be willing to use both devices in a combat situation.

3.2.5 Mission Planning and Troubleshooting Segment

Soldiers found that planning a mission and communicating that plan within the squad was much easier with the FFW gear than with baseline equipment. The Soldiers found the troubleshooting chart to be helpful and easy to use. They had mixed feelings about whether the chart should be embedded in the software. Embedding the chart in the software would be convenient but problematic if the system failed to start. One possible solution suggested was to have redundant charts, one stand-alone and the other embedded.

3.2.6 Reconnaissance and Defense Segment

The Soldiers reported no major problems in learning to use the FFW equipment for reconnaissance and defense. They were enthusiastic about the value of the FFW gear for mission planning, land navigation, and SA.

Again, there were complaints about the goggles fogging. A couple of Soldiers suggested that the display on the goggles be mounted on a swivel so that it could be moved aside from their eye when not needed. There were no significant problems with the PDA or the MFL and XM-104 laser devices.

3.2.7 Post-Training Support Staff Activity

The FFW technicians were administered a questionnaire addressing issues about maintaining the systems during the training period. Their responses indicated that the system needs improvement in terms of ruggedness and reliability.

The initial system assembly took 1 to 2 hours. Cable routing was the most time-consuming task. After the system was assembled, daily verification took approximately 10 to 12 minutes per system and 30 minutes to 1 hour to get the entire squad ready for a mission. No major problems were encountered in powering the systems. It could take 15 to 20 minutes to power the radios. Inspecting a system for failures could take 10 to 15 minutes.

It took 3 to 4 hours to charge two batteries and all night to charge the batteries for the entire squad with the number of chargers available. Once charged, the batteries operated for 8 to 10 hours.

The most common problems reported by the engineering support staff during field use were

- Cables and connectors coming loose
- SWD goggles fogging
- GMD mounting plate wire breaking
- PDA failures
- Voice communications failures
- Software failures

Software malfunctions could generally be fixed by the re-booting of the system in the field.

Some Soldiers experienced some difficulty in securely fastening the body armor chassis at the shoulders. This is partly attributable to the position and uncomfortable reach to fasten the body armor.

In the eyes of the technicians, the Soldiers were fully capable of learning and following the troubleshooting guidelines. They did feel that the system should be more rugged and reliable, especially the cables and connectors. The technicians also recommended the inclusion in the field kit of a multimeter to test the electronic components, some specialty electronics tools, and a spare system to monitor SA and voice while the Soldiers are training.

3.3 Pilot Test Phase

As in previous exercises, most of the required activities were facilitated by the use of the FFW hardware and software.

Once again, problems emerged with the display used on the SWD goggles. In addition to the goggles fogging, the display interfered with night movement by degrading dark adaptation. There was a consensual opinion that the display used on the SWD goggles does not work very well in conjunction with NVGs. The brightness of the display overpowered the non-aided eye, thus eliminating the advantage of having a monocular night vision device.

Soldiers had a difficult time getting the voice-activated controls to work consistently. It was as if the excitement of the attack and the strain of the cross-country navigation negated the ease of use on the voice activation control. They were reluctant to use the voice-activated controls in proximity to enemy forces.

There were complaints about using a memory stick or thumb drive (supplemented and not part of the FFW ensemble) to share information such as fragmentary orders and overlays. Sharing information with such a device requires physical contact with every squad member.

Some Soldiers noted that the map default setting should be military grid reference system (MGRS) rather than latitude-longitude.

3.4 Assessment Phase

3.4.1 Defensive Exercises

Many of the tasks were the same for the defensive and offensive exercises. In addition, the Soldiers' task ratings (on a 1 [extremely difficult] to 7 [extremely easy] scale) were highly correlated for the defensive and offensive missions so that their responses can be aggregated. Figures 16 and 17 illustrate task ratings for defensive and offensive missions combined.

Figure 16 shows the mean task ratings for the planning phase of the missions. All the tasks were rated as being very easy.

One Soldier suggested that adding a drawing capability to the PDA software would make it easier to draw a sector sketch.

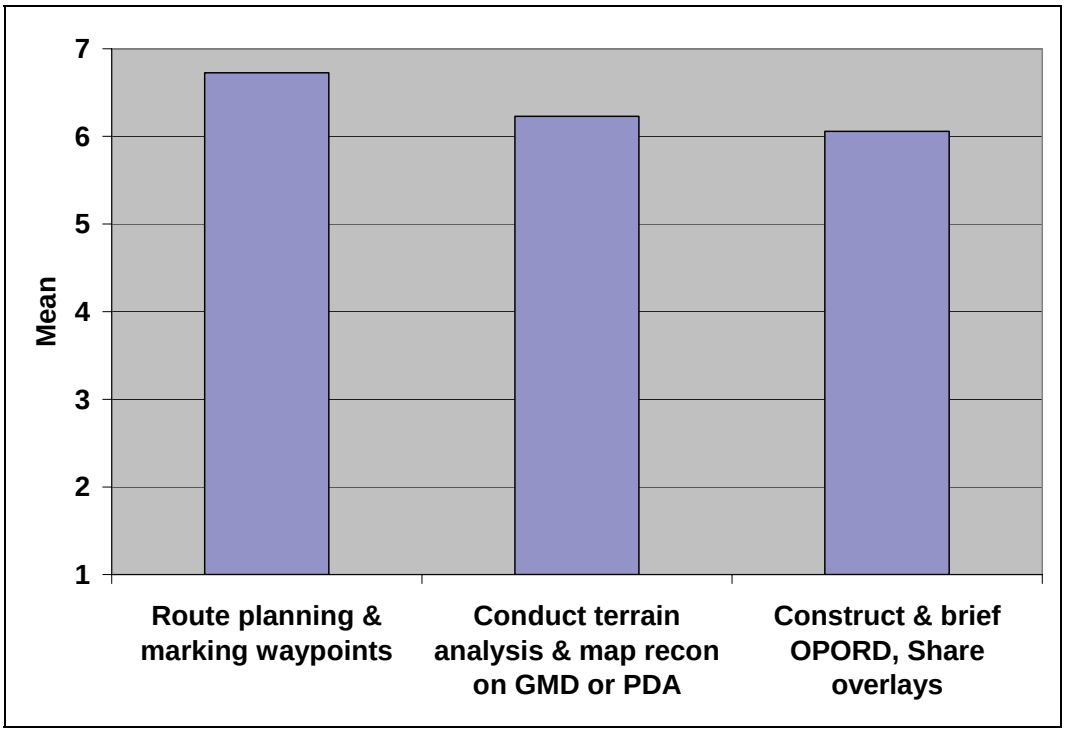


Figure 16. Mean task difficulty ratings, planning phase, defense and attack.

Ratings for tasks performed while Soldiers were en route to the objective are shown in figure 17. Again, Soldiers found all activities to be very easy, although the voice-activated controls were not always functional. Voice-activated controls appear to be affected when the voice is under the stress of movement or under excitement or duress. When the voice-activated controls were not working, the Soldiers reverted to the trackball mouse as an input device. This device was readily available and was easily used by all the Soldiers.

One Soldier had more difficulty than others with the voice-activated controls. He had a very soft-spoken southern ethnic accent. He reported that the "center on me" command never worked and that other commands ("zoom in/out" or "bring up other window") only worked intermittently.

The Soldiers found the PDA useful when they were in a static position. It was inconvenient, however, to halt during movement to check the PDA display.

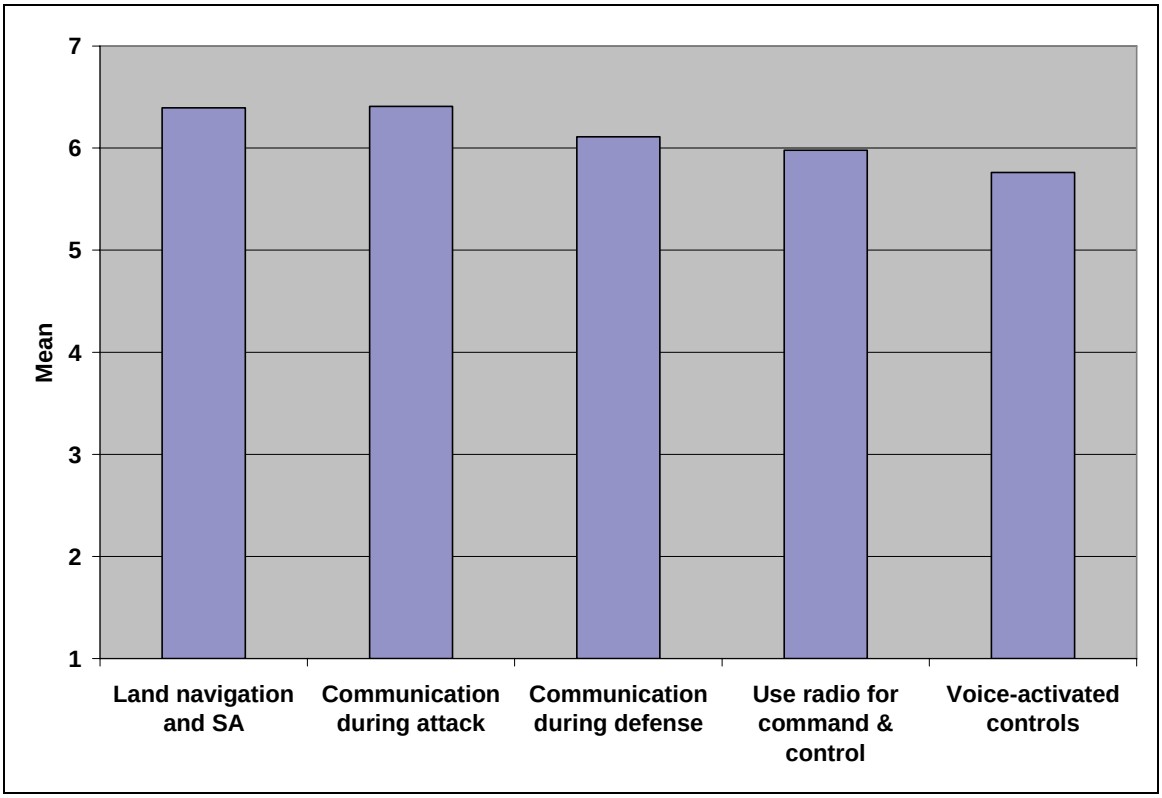


Figure 17. Mean task difficulty ratings, en route to objective, defense and attack.

Soldiers also had little difficulty in performing required tasks on the objective (see figure 18) and in the military operations on urbanized terrain environment (see figure 19).

Most of the problems during the defensive and offensive missions occurred in night activities (see figure 20). The Soldiers had the same complaints about the GMD as they had in the pilot exercises: the SWD goggles fogged easily and the display was incompatible with NVGs. The Soldiers were not confident in their ability to maintain light discipline with the PDA or the GMD.

Soldiers were concerned about improving the look of the icons to make them more intuitive and easier to interpret. The FBCB2 icons have long internet protocol addresses that fill too much of the display screen. Once again, the Soldiers complained of the time lag imposed by the slow refresh rate of the icons.

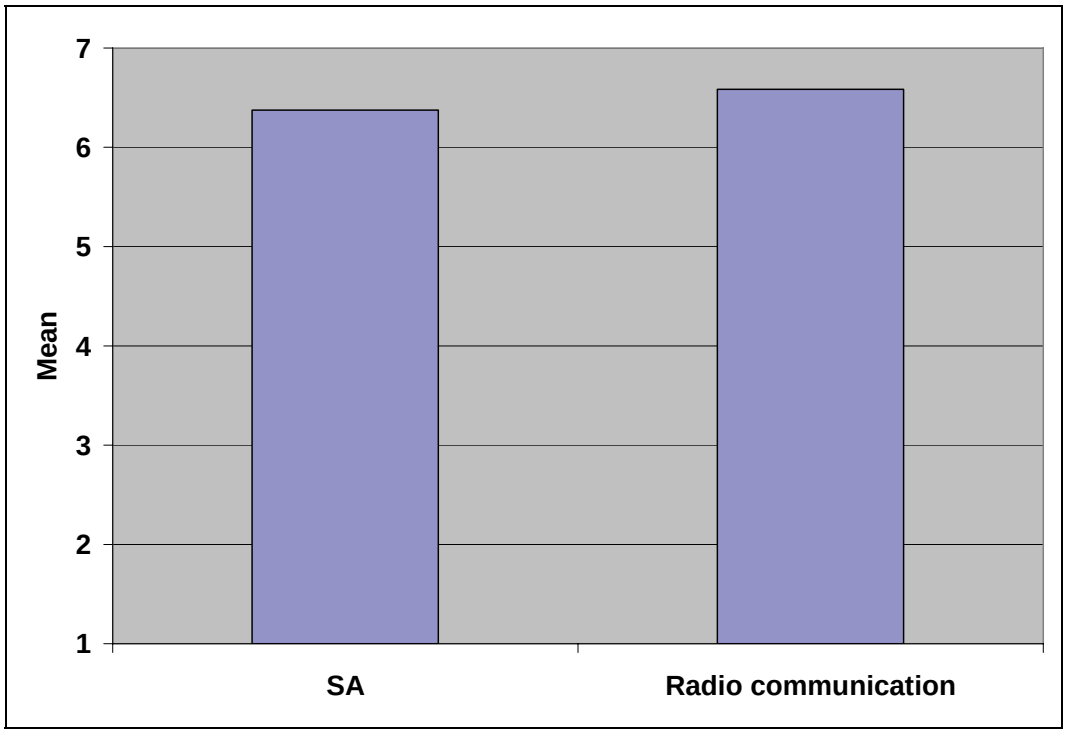


Figure 18. Mean task difficulty ratings, on the objective, defense and attack.

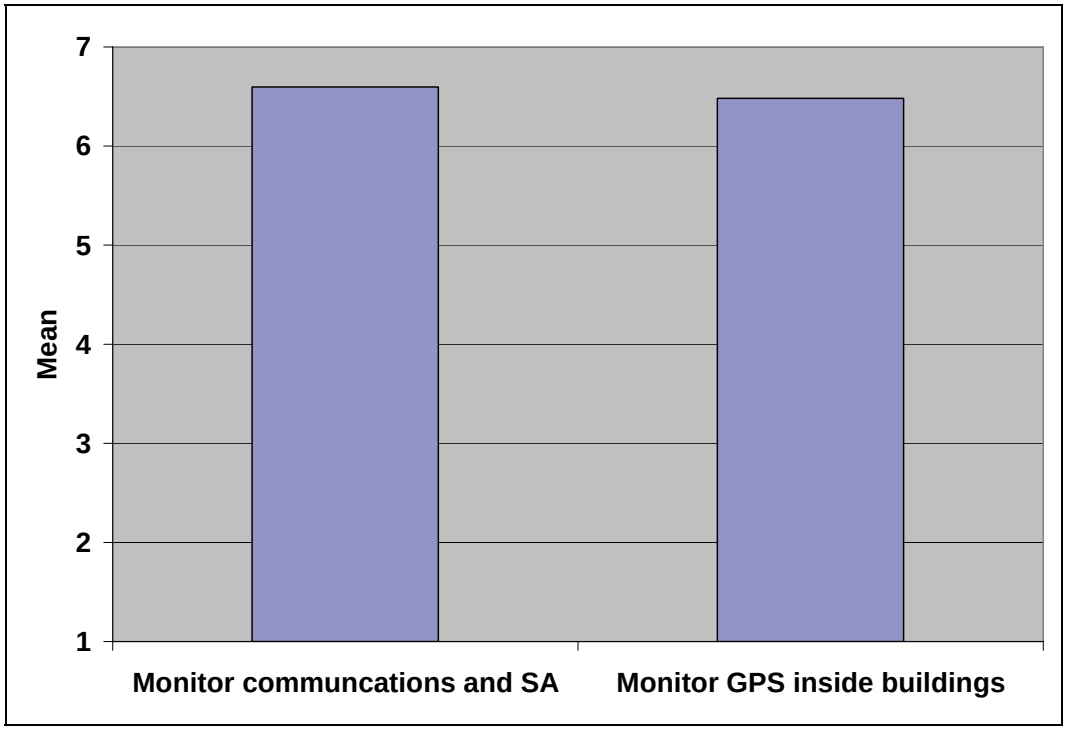


Figure 19. Mean task difficulty ratings, MOUT activities, defense and attack.

There were complaints of a distracting clicking sound coming from the computer. It was not determined if the Soldiers thought this was loud enough to give away their position, but it was loud enough for them to complain about the noise. Further evaluation is needed to determine how far the noise can be heard at night and during the day.

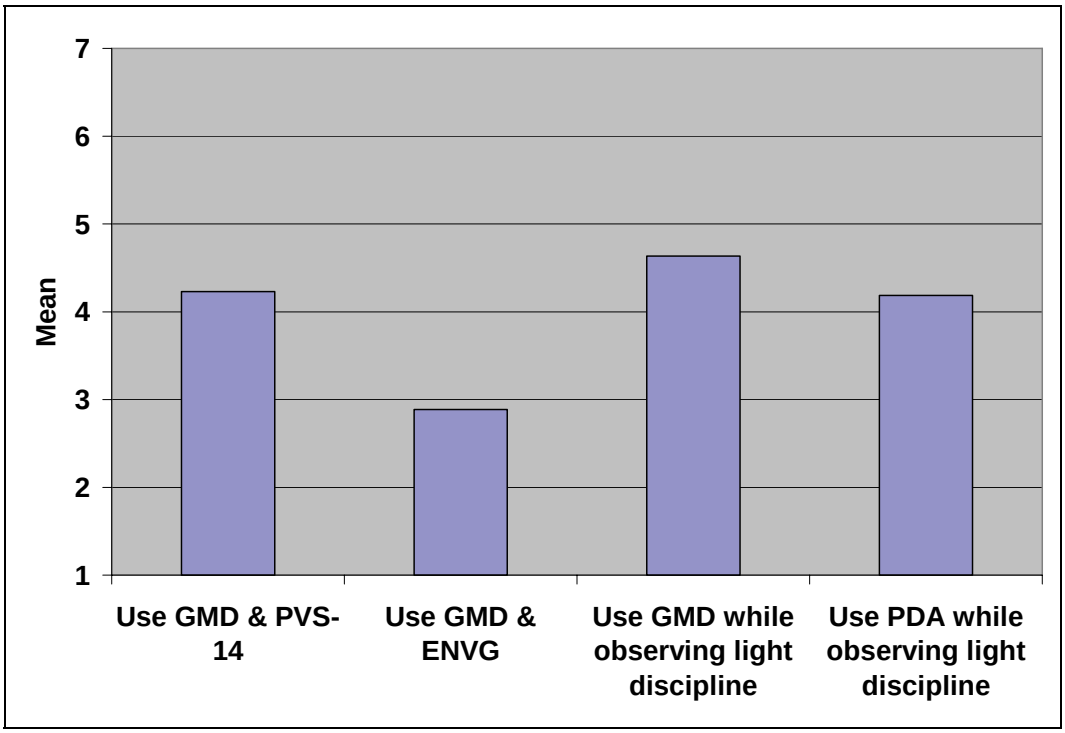


Figure 20. Mean task difficulty ratings, night activities, defense and attack.

3.4.2 Offensive Exercises

Most of the tasks involved in the attack exercises were completed with little difficulty.

Some Soldiers were irritated at having to use the memory stick/thumb drive to disseminate changes in the mission plan. At least one Soldier preferred a face-to-face briefing for the operations orders (OPORD). He did not give a reason for his preference.

The Soldiers reiterated the previously noted difficulties with the display mounted on the SWD goggles: fogging, especially in the rain, and its incompatibility with NVGs. One Soldier addressed the problem of using the NVG and display together by covering the display with electrical tape, then removing the tape for a quick glance into the display.

The Soldiers were generally positive about the PDA, but they noted that it was difficult to use during movement. In order to check the PDA display, the Soldier had to remove the PDA from the pouch on the left-hand side of the chassis. Again, they were concerned about the level of light emission from the PDA.

The Soldier with the heavy southern ethnic accent reported a problem with getting the voice control system to activate. Throughout the event (training, pilot, and experiment), he had difficulty with the voice-activated controls. The combination of his ethnic accent and his softer than normal tone was believed to cause the problems. Other Soldiers did not have the same problems. Two Soldiers said that the radio did not always function properly in the rain. Some difficulty was noted in monitoring the platoon net and squad net at the same time. One Soldier reported that his radio communication did not reach his leader because the leader was listening to another channel. Some intra-squad communications were lost when the leader was listening to the platoon net because he was not able to monitor both nets simultaneously.

Although the Soldiers were very positive about the SA capability of the FFW system, they said that SA was hampered by the slow refresh rate of the icons. They asked for iconography that more closely reflects real-time reality.

3.5 Post-Assessment

3.5.1 Uniform

As shown in figure 21, Soldiers were very positive about most of the components of the FFW uniform (pants, shirt, knee and elbow pads) although there were some reservations about the ballistic belt. Two Soldiers experienced problems in obtaining a good fit with the ballistic belt. One Soldier, who weighed 140 lb, complained that his belt was too large. A second Soldier, of medium stature and weight, reported some discomfort from the belt chafing and pinching.

Most of the Soldiers reported that their knee pads stayed in place during movement (see figure 21). The stability of the knee pads was a significant problem during the FFW Engineering Design Event 4 conducted in 2005 (Turner, Carstens, and Torre, 2005.) In the 2005 test, there were numerous complaints about the knee pads shifting and rubbing against the shins. It is not known how the knee pads were modified, but the changes were effective. The FFW engineering staff responsible for the uniform should be contacted to determine what modifications were made and to ensure that nothing further is modified. All the Soldiers liked the elbow pads. All the test Soldiers thought that the FFW uniform was more durable than the Army combat uniform (ACU) and that the different camouflage pattern of the FFW uniform was superior to the ACU.

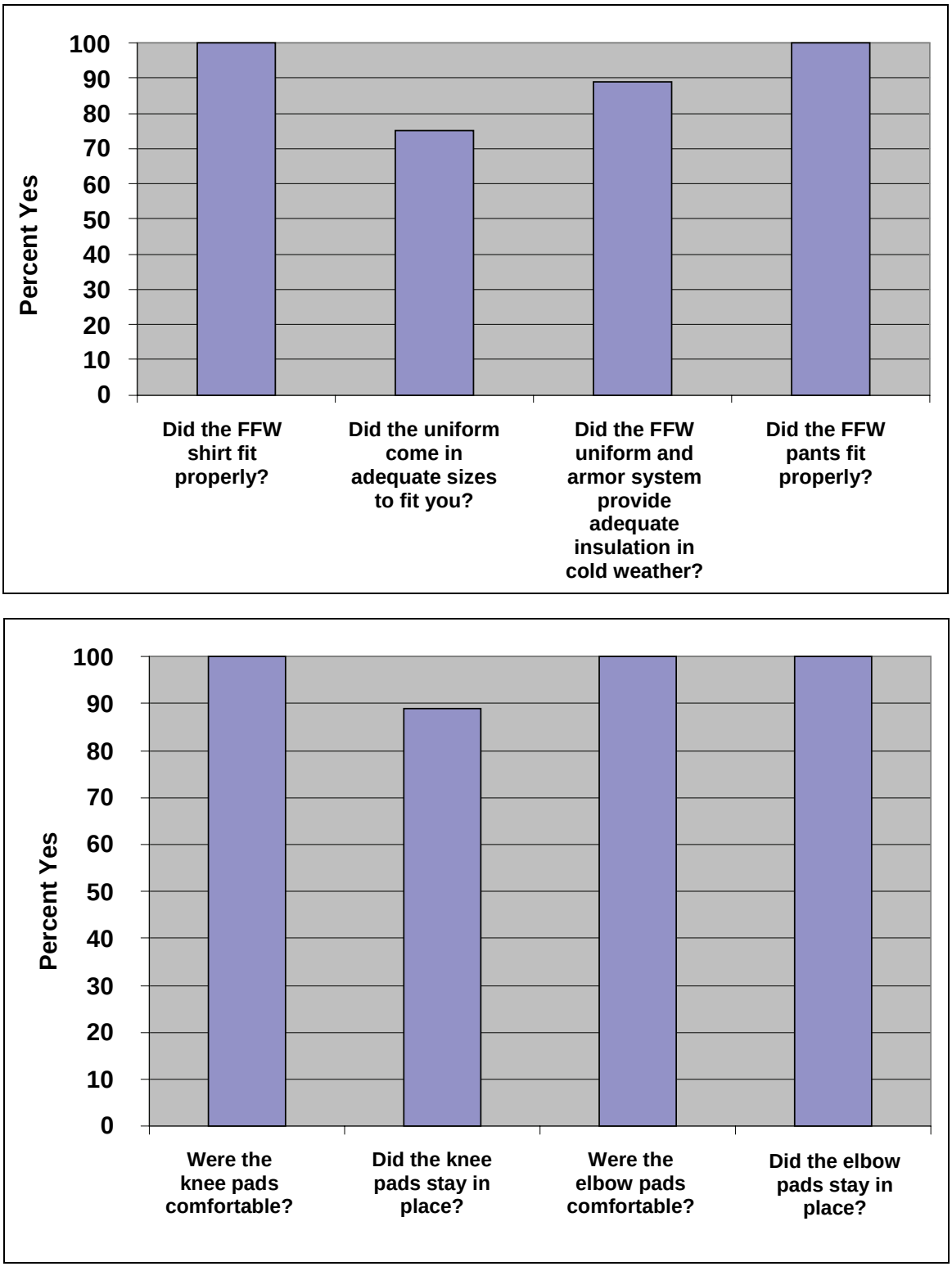


Figure 21. Percent "yes" responses, FFW uniform.

3.5.2 Protective Equipment

The Soldiers generally liked the FFW helmet (see figure 22) and reported that it was superior to the Army combat helmet (ACH) in terms of heat mitigation. There was a complaint about the forward weight of the helmet with the NVGs mounted, but this problem was not any worse than with the NVGs on the ACH. One Soldier did not like the fit of the helmet, but he does not like to wear the ACH either.

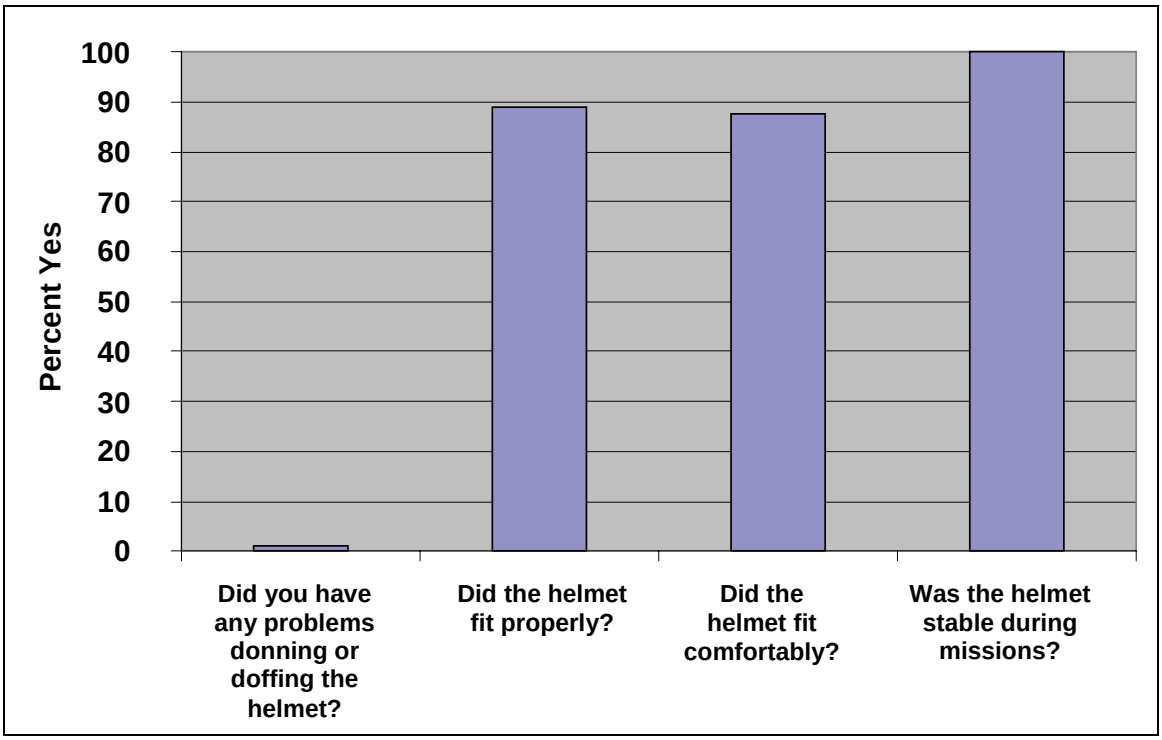


Figure 22. Percent "yes" responses, helmet.

The Soldiers liked the body armor chassis better than the baseline interceptor body armor (IBA) (see figure 23). Load-carrying capacity was acceptable; all equipment items attached easily to the chassis and were easily accessible. The stand-off distance of the body armor, in conjunction with the moisture-wicking fabric of the shirt, kept heat accumulation to a minimum.

Soldiers rated their ability to engage in tactical movement about the same with the FFW ensemble as compared with the baseline gear. Figure 24 shows that there were no major problems in moving with the FFW gear, but it was difficult for Soldiers to move through small cramped spaces wearing the backpack computer. There was one report of the helmet cables becoming entangled in vegetation.

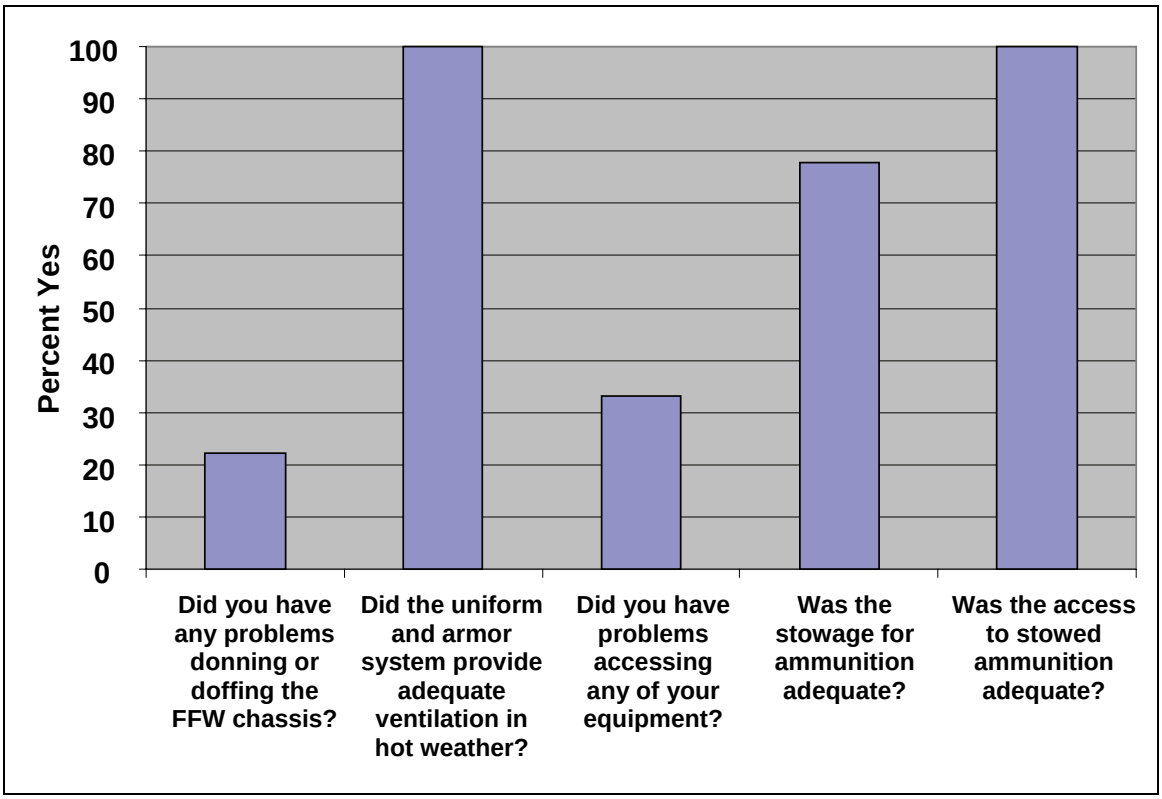


Figure 23. Percent "yes" responses, body armor chassis.

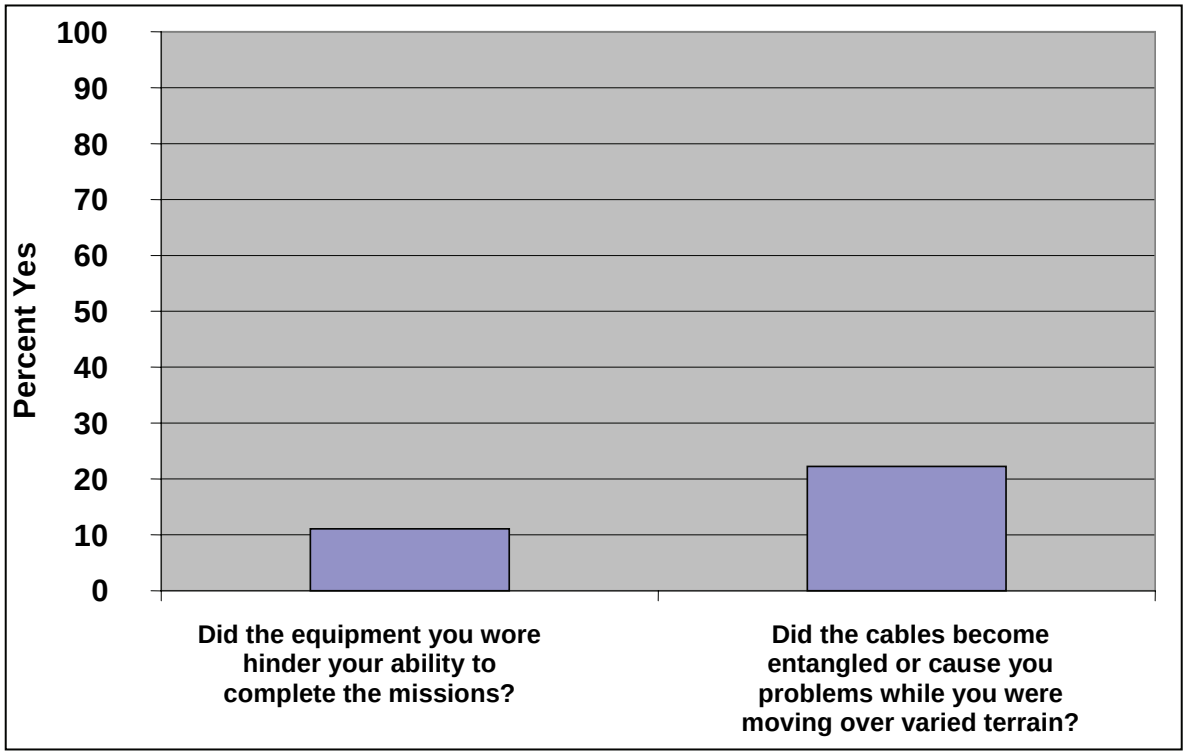


Figure 24. Percent "yes" responses, tactical movement.

3.5.3 GMD and PDA

There was much dissatisfaction with the goggles and the display mounted on the goggles (see figure 25). The icons on the GMD display were too small to see easily. There were also complaints of glare on the display. There was a consensus that the GMD (both the SWD goggles and the display) does not work well with the AN/PVS-14s and the enhanced night vision goggles (ENVG). Movement over rough terrain at night works best when the Soldier can use a monocular NVG in conjunction with a dark-adapted unaided eye. The display appears to be too bright and degrades the dark adaptation of the unaided eye.

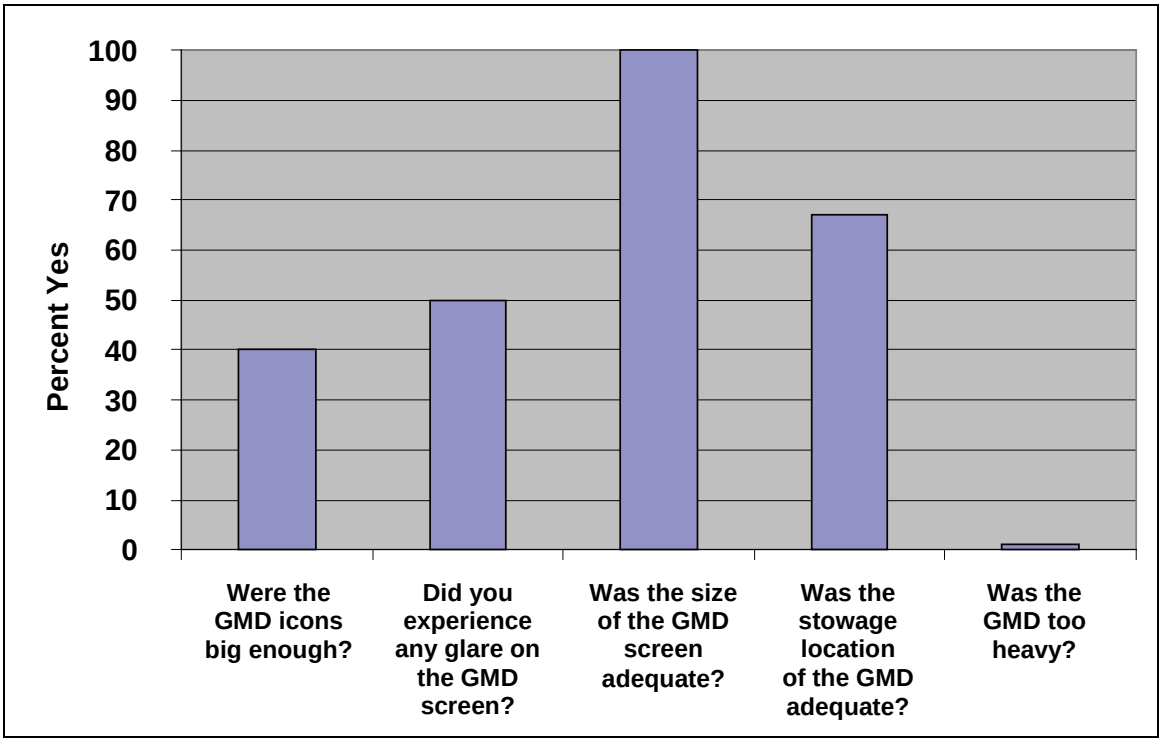


Figure 25. Percent "yes" responses, GMD.

As illustrated in figure 26, the Soldiers were generally positive about the PDA although there were some areas of concern. Occasionally, the PDAs failed to function. The icons were too small on the display screen. The Soldiers found it awkward to stop and use the PDA during tactical movement. Even with the luminance on the lowest setting, Soldiers worried that the light emission from the PDA could compromise their position.

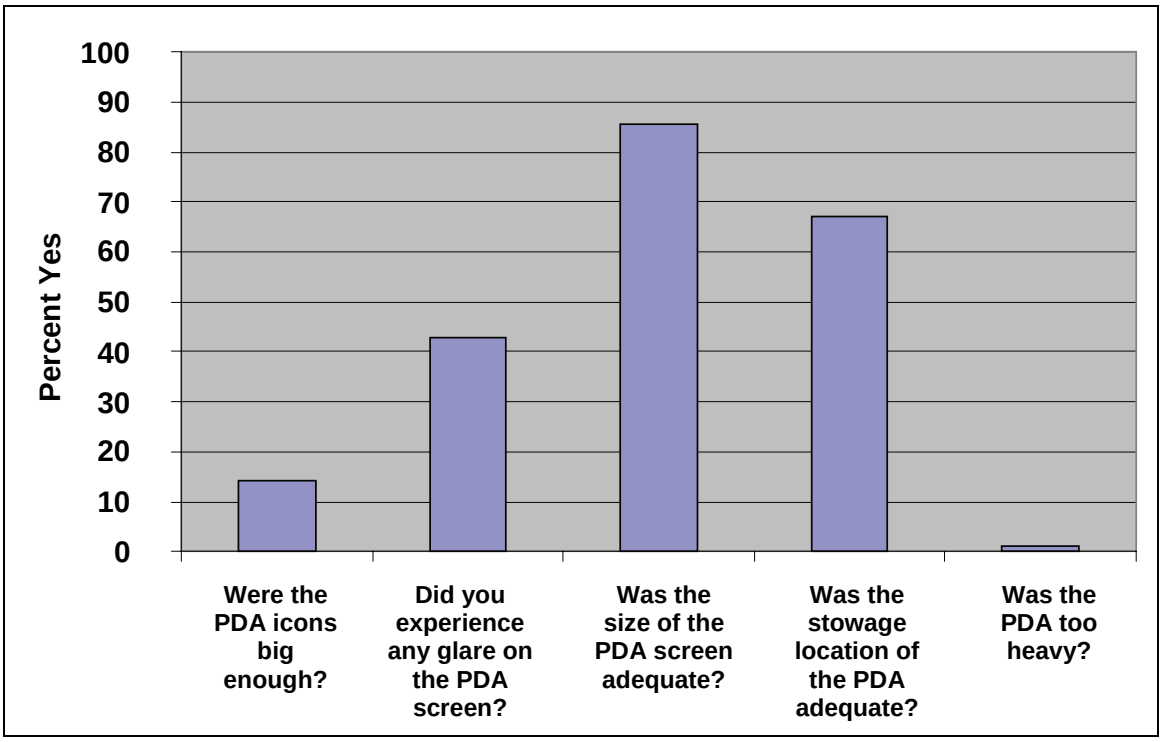


Figure 26. Percent "yes" responses, PDA.

3.5.4 Software

The Soldiers were generally satisfied with the C2 MINCS and the FalconView software packages. Both were fairly easy to learn to use, and the menus were intuitive. The software systems were especially helpful for mission planning, land navigation, and maintaining SA.

There was a consensus that a faster refresh rate was needed on the software. Some Soldiers requested maps that have a higher zoom power, and at least one Soldier wanted topographical maps included in the software.

3.5.5 Laser Devices

Both the MFL and the XM-104 were easy to use, and both received very high ratings for all tasks (see figures 27 and 28). Although the Soldiers were unable to use the laser devices in a live fire exercise (no live fire exercises were scheduled for this experiment), they were confident that the devices would accurately designate targets in a combat situation.

One Soldier suggested that holding the MFL on target would be easier if the weapon were equipped with a bipod.

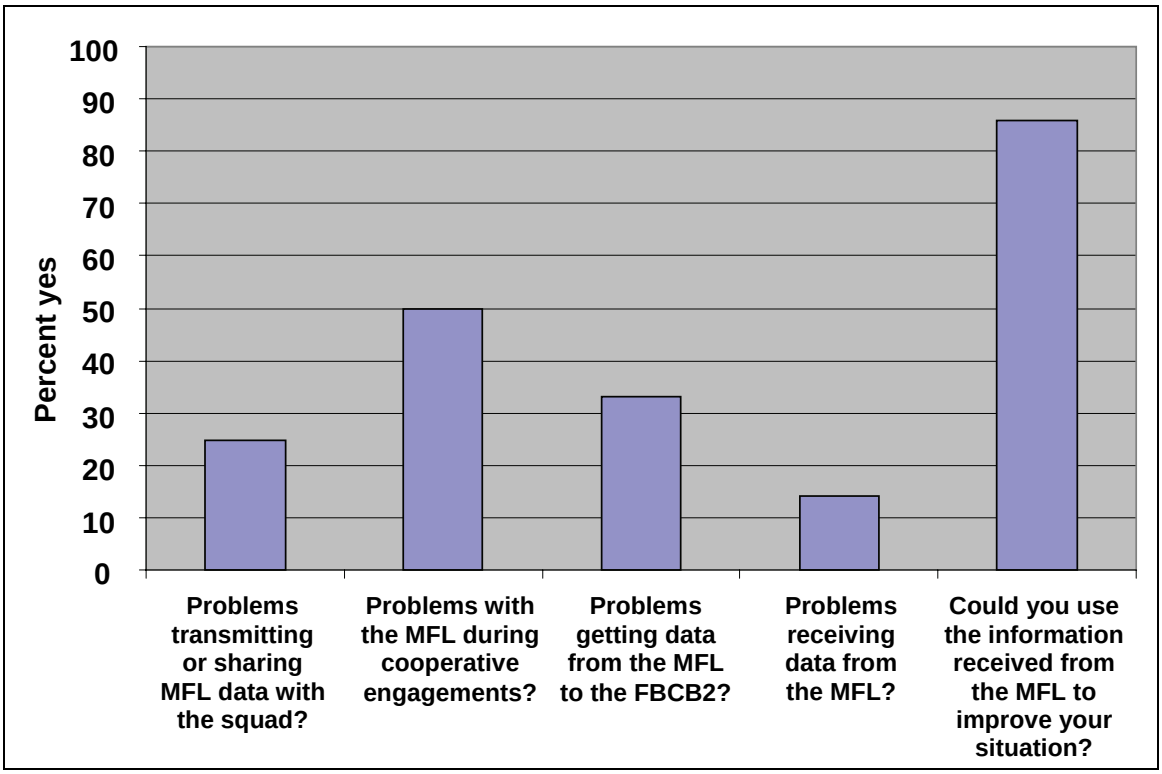


Figure 27. Percent "yes" responses, MFL.

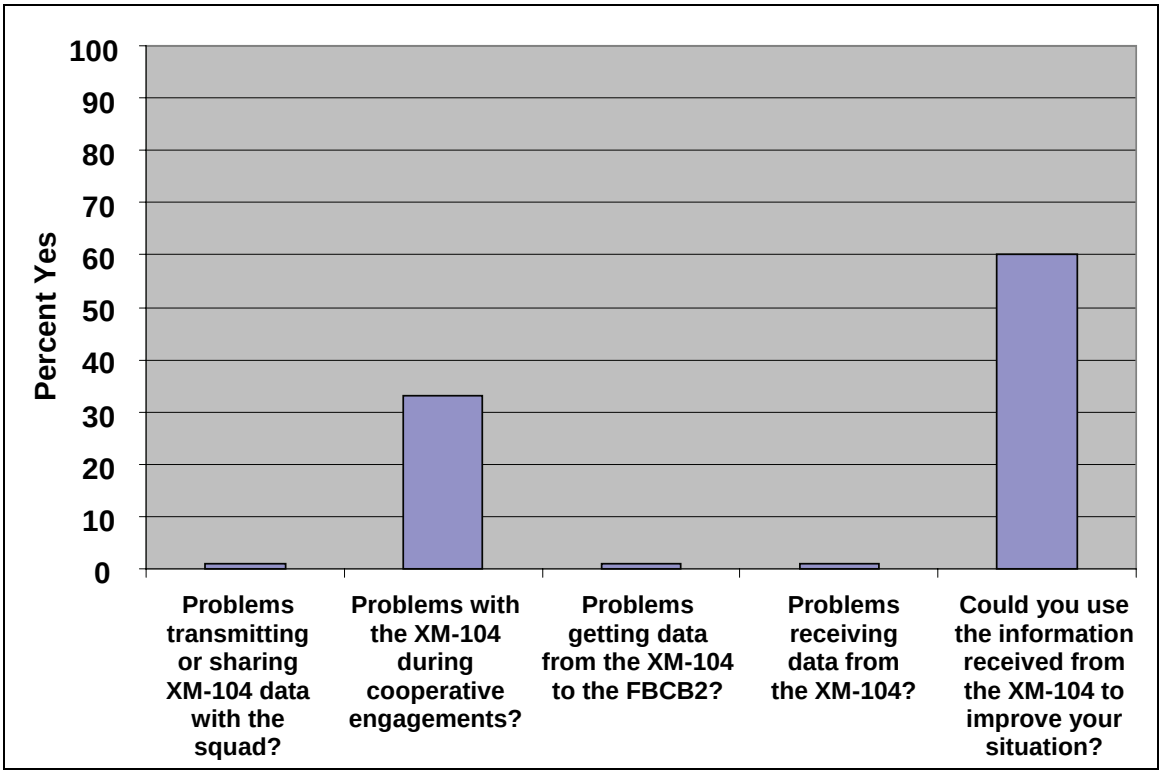


Figure 28. Percent "yes" responses, XM-104.

3.5.6 Voice Activation System

The voice activation system was inconsistent; sometimes it worked, sometimes not. Soldiers reported that they needed to speak slowly and loudly in order to make the system work. Some Soldiers said that they had to adopt a neutral accent because the system did not respond well to a southern ethnic accent. The system did not work well during or immediately after exertion; heavy breathing interfered with voice activation (see figure 29). Soldiers were reluctant to use the voice activation controls if enemy forces were nearby. Despite the problems with the current system, they felt very favorably about the use of voice activation.

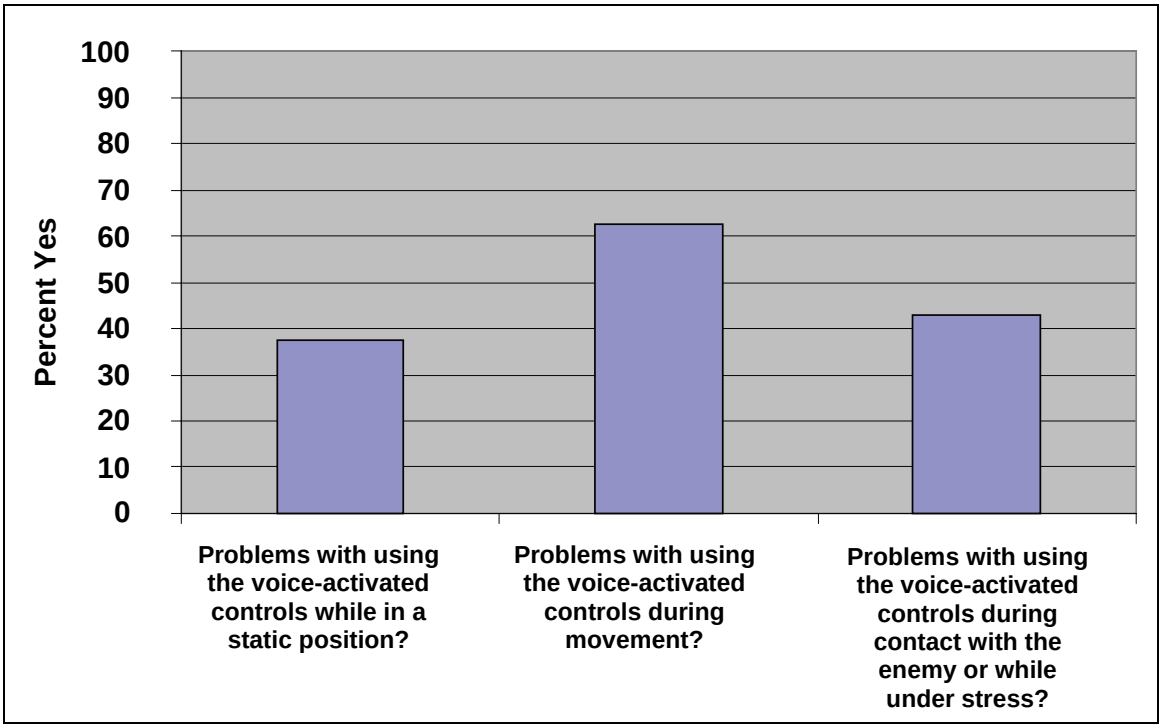


Figure 29. Percent "yes" responses, voice-activated controls.

3.5.7 Bone-Conduction System

Responses to questions about radio communications are shown in figures 30 and 31. Occasionally, the Soldier's auditory channel was over-loaded when he was trying to monitor the squad radio traffic and the platoon net.

Several Soldiers commented that they would like the bone conduction headset to be detachable from the helmet so that they could communicate with the helmet off.

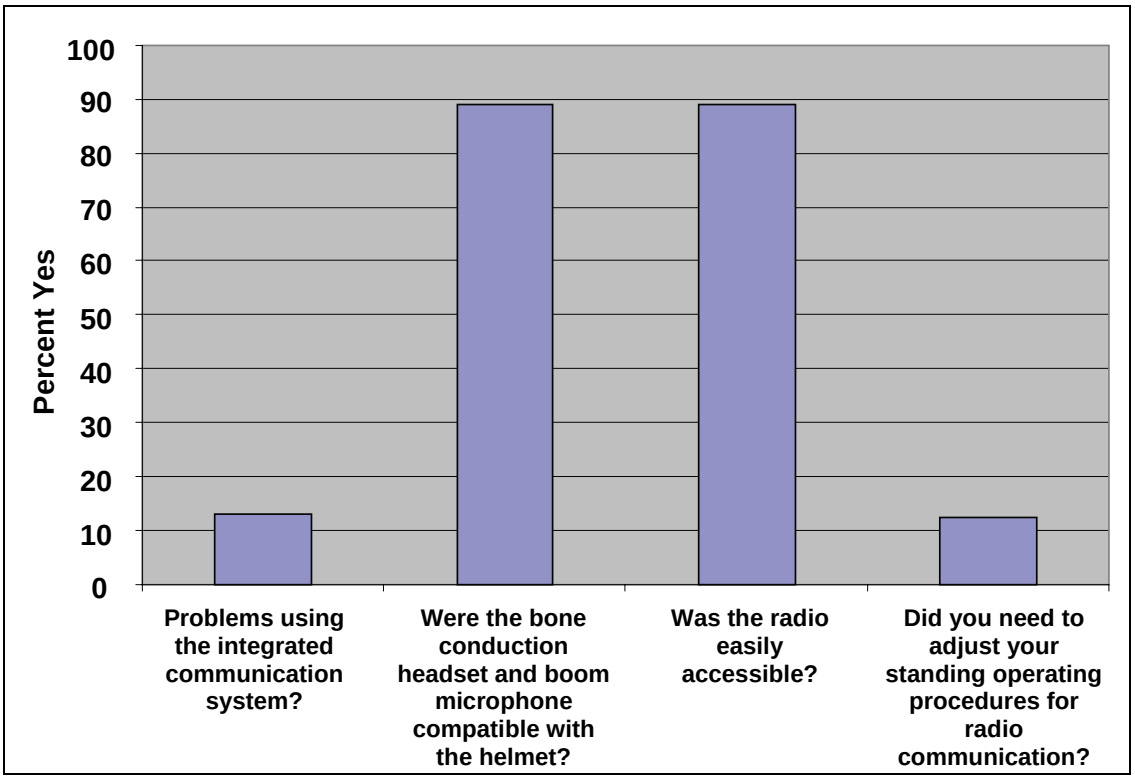


Figure 30. Percent "yes" responses, bone conduction.

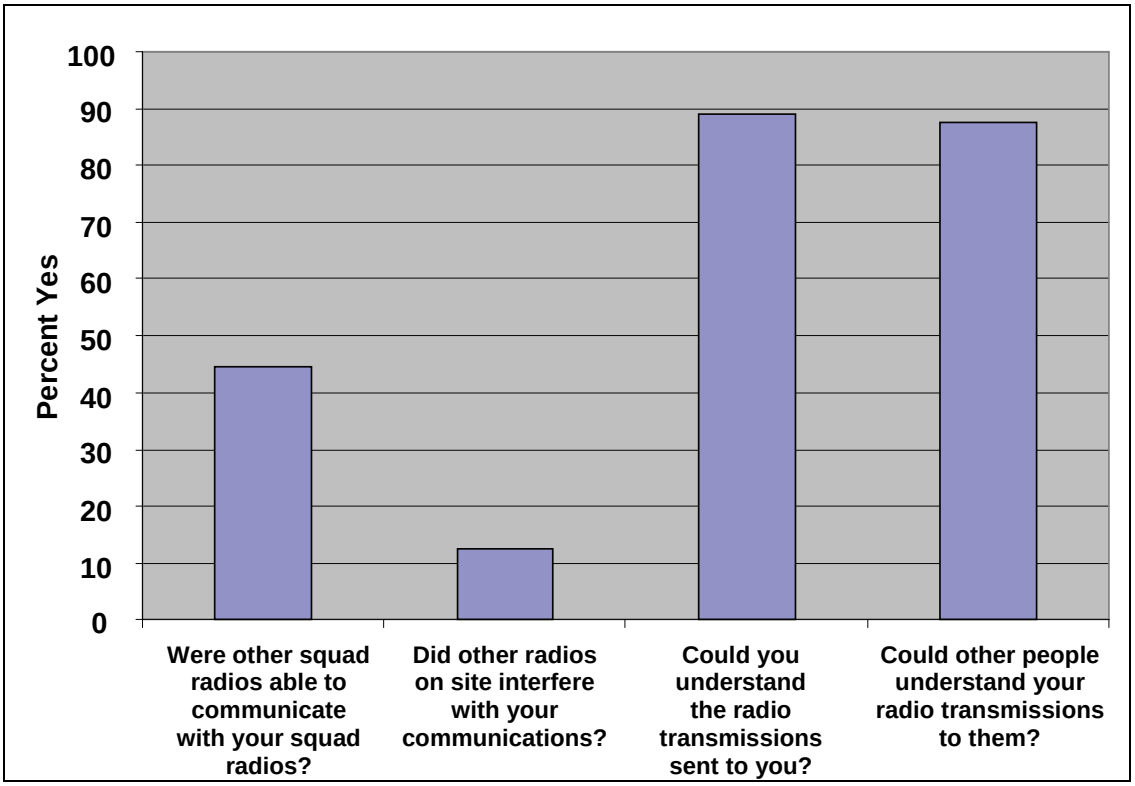


Figure 31. Percent "yes" responses, radio communications.

4. Discussion and Conclusions

The FFW system was very well received by the test Soldiers. They strongly preferred the FFW equipment to their baseline gear for virtually every activity in every scenario.

The features of the system that the Soldiers liked included

- Ease of learning to use the FFW system
- Being able to maintain radio contact with squad members
- Route planning, marking waypoints, and land navigation
- SA: Knowing location of self, team members, and enemy forces
- Display sizes on the GMD and PDA
- Intuitive and easy menu use
- Easy sharing of MFL and XM-104 data
- Load-carrying capacity and ventilation from the stand-off distance in the body armor chassis
- Equipment stowage and access
- Integrated knee and elbow pads

The Soldiers also noted a number of areas requiring improvement. Table 4 lists the areas needing improvement and potential solutions to the problem areas.

The technology that is being incorporated into the FFW system raises the possibility of perceptual/ cognitive overload for Soldiers and leaders, especially if they are fatigued and working in stressful combat conditions. Table 5 shows the information flow to visual and auditory channels with the current FFW configuration. It is conceivable that even more demands may be placed on the visual and auditory channels in subsequent iterations of the FFW system. One way to mitigate this potential problem is to off-load tasks to other sensory modalities. We recommend that some consideration be given to developing a tactile display system for alerts. Such a system could be based on existing vibro-tactor and wireless connectivity technology. A tactile alert system can be lightweight, covert, and intuitive, with minimal threat to Soldier survivability.

Table 4. Improvements needed.

Improvement Needed	Potential Solution
Icon sizes on display screens were too small.	Institute a "zoom in" capability so that icons can be seen. If identification of an icon is needed, consider showing a text description of the icon when the curser is placed over the icon.
Some icon IP addresses too large and complex	Simplify iconography. If identification of an IP is needed, consider showing a text description of the icon when the cursor is placed over the icon.
Low zoom resolution on maps. Individual squad members could not be seen and looked like one big blob.	Include maps with 50-m grid squares.
Glare on display screens.	Use non-glare surfaces or add a screen to reduce glare.
Slow refresh rate of the icons.	Increase refresh rate.
Lack of PDA light security and, to a lesser extent, concern about GMD light security.	Add the ability to reduce the brightness of the displays so that they are compatible with NVGs.
There is a potential for loss of dark adaptation with any system that uses a visual display.	Any visual display device should be equipped with a sensitive gain adjustment so that the luminance can be set on a minimum detectable level.
Unreliable voice activation control system.	Increase reliability and ensure that the back-up mouse is readily available.
Fogging of the SWD goggles with the GMD mounted inside. Durability of the GMD mounting system. Incompatibility of GMD with NVGs. GMD is not capable of mounting on either eye.	Investigate alternate mounts for the display.
Ruggedness of cables and connectors.	Increase ruggedness without increasing weight.
Lack of redundant troubleshooting charts.	Include one stand-alone chart and one embedded in the software.
Latitude-longitude map default setting.	Make the MGRS the default setting.
PDA mounting location is not convenient for use during movement.	Consider mounting PDA on forearm for easy access.
The buttons on the mouse are inadvertently pressed while it is stored in the vest.	Add a cover over the buttons.
Mouse location is not convenient.	Consider mounting it on the weapon.

Table 5. Visual and auditory processing demands.

Visual	Auditory
Immediate surroundings and terrain	Immediate surroundings
Visual contact with squad members	Auditory contact with squad members
PDA/GMD map display	Intra-squad radio
PDA/GMD OPORD display	Platoon net
	System alerts

5. References

Turner, D.; Carstens, C.B.; Torre, J. *Future Force Warrior, Engineering Design Event Number 4*; ARL-TR 3626; U.S. Army Research Laboratory: Aberdeen Proving Ground, MD, 2005.

Appendix A. Demographics

DEMOGRAPHICS

SAMPLE SIZE = 8

Anthropometric measurements:

Roster	Height (in.)	Weight (lb)	Chest circumference (in.)	Waist circumference (in.)
1	73	195	38.0	35.0
2	72	244	48.0	43.0
3	71	180	39.0	35.5
4	69	160	38.0	32.0
5	68	174	38.0	35.5
6	71	164	38.0	32.7
7	66	140	36.0	30.5
8	72	225	44.0	42.0
9	71	165	35.5	32.8

Roster	Length from underarm to waist (in.)	Hat size	Head circumference (in.)	Shirt size
1	13	7.00	21.0	m
2	13	7.75	23.0	xl
3	12	7.75	20.5	l
4	13	7.13	22.0	m
5	12	7.50	22.0	m
6	12	7.38	22.0	m
7	11	6.88	21.5	s
8	13	7.13	22.5	l
9	11	7.13	23.0	M

AGE	MOS	RANK	TIME IN SERVICE	GT SCORE
28 years (mean)	11B - 8	E-1 - 1 E-4 - 3 E-5 – 3 E-6 – 1	7.4 years (mean)	116 (mean)

1. Do you wear prescription lenses? 4 yes 4 no

2. If yes, which do you wear most often? 2 glasses 1 contacts
1 NR

3. Which do you wear when firing a weapon?

2 glasses 1 contacts
2 NR

4. With which hand do you most often write with?

7 right 1 left

5. With which hand do you most often fire a weapon?

6 right 1 left
1 NR

6. What size ACUs do you wear?

Pants: LR, LS, MR (3), ML (2), SS
Shirt: LR (2), MR (3) ML (2), SS

7. Time in current duty position:

3 years 3 months (mean)

8. Latest APFT score:

254 (Out of 300) (mean)

9. Have you had any experience with the Land Warrior program? 3 yes 5 no

10. What is your current assigned personal weapon? 6 M4 2 SAW

11. Latest weapon qualification score: 33 (Out of 40) (mean)

12. What was the date and weapon used for latest qualification score?

6 M4 (Jan06, Feb06 (3), Jun06) 1 M16A2 (Sep06) 1 SAW (May06)

13. Have you served in a combat or hostile fire zone? 7 yes 1 no

14. If so where?

3 Afghanistan 1 Panama 1 Kosovo

15. Using the scale below, please rate your knowledge of Knowledge, Skills, and Abilities (KSA) related to infantry duties:

1	2	3	4	5	6	7
Extremely bad	Very bad	Bad	Neutral	Good	Very good	Extremely good

	MEAN RESPONSE
Infantry tactics, techniques, and procedures (TTPs)	6.00
Using night vision systems	6.13
Using hand-held laser designators	5.25
Patrolling	6.00
Reconnaissance, surveillance, and target acquisition procedures	5.25
Mission planning	5.38
Preparing FRAGO	5.38
Map reading and orientation in the field	5.88
Land navigation	6.00
Conducting ambushes	5.88
Conducting hasty defenses	5.88
Conducting point reconnaissance	5.63
Conducting urban operations	6.00
Selecting routes for land navigation	6.00
Selecting routes for movement to contact	5.88
Knowledge of MILES	5.88
Use of MILES	5.88
Room clearing tactics	6.00
Communications equipment and procedures	5.88

16. What load carriage system do you typically use? 7 MOLLE 1 ALICE

17. What type of tactical headgear to you typically wear?
8 ACH/MICH 0 CVC 0 PASGT (KEVLAR)

18. If other, please specify.

19. What type of body armor do you typically wear?
8 Interceptor 0 PASGT/KEVLAR

20. Military training/instruction received (number of responses):

8 Basic training	2 Advance (Infantry) training
1 PLDC	1 BNCOC
0 ANCOC	0 IOBC/OCS
0 Ranger	5 Airborne
0 Sniper	0 Bradley Leaders Course
0 Master Gunner	0 ICCC
5 Combat Life Saver	2 Other: Air Assault

Appendix B. Future Force Warrior Training Phase: Initial Training

SAMPLE SIZE = 9

1. Did you have any problems with fitting (donning and doffing) the FFW chassis?

1 Yes
8 No

Comments	**No. of Responses**
I like the way the whole system fits and feels.	1
The chassis is definitely more comfortable than the IBA. It also gives me much more range of motion.	1
Biggest problem I'm having problems with is the belt. It puts pressure on my rear end. Hardly wore it and it was really uncomfortable.	1

2. Did you have any problems with fitting (donning and doffing) the FFW helmet?

1 Yes
8 No

Nice lightweight helmet that does not give me a headache and take away from my situational awareness.	1
Yes, with the chin strap.	1

3. Did you have any problems connecting the cables to power the FFW systems and radios?

0 Yes
9 No

Plenty of cable for head movement.	1

4. Did you have any problems understanding the software functions as explained during this event?

0 Yes
9 No

Comments	**No. of Responses**
The software was easy to use, but most of the waypoint and icons using grids had a default of lat/long. Since we never use lat/long, I think the default should be MGRS.	1
On some programs, was taught to pick up until I did more hands-on training.	1

5. Did you have any problems in learning how to plan routes using this system?

0 Yes
9 No

It was an easy task.	1
The software was easy to use, but most of the waypoint and icons using grids had a default of lat/long. Since we never use lat/long, I think the default should be MGRS.	1

6. Did you have any problems learning how to navigate cross country with this system?

4 Yes
5 No

GPS not working.	2
If GPS were working, I believe it would be very easy.	1
Icon didn't move.	1
Well there are some problems with the C2 MINCS, but it is a PDA and I can't expect much. A filter system so I can, for example, show myself only and the icons/points I only want to go to.	1

7. Do you understand the "shared waypoints" concept, and did you have any problems using this technique?

2 Yes
7 No

Just my voice command needs a little tone or I need to speak a little louder.	1
On C2 MINCS it causes mass confusion. SOP (standing operating procedure) with all using C2 MINCS would be to have specific colors set up. Maybe more color options for icons would be a good idea.	1

8. Do you feel that the training you received was adequate to prepare you to use the FFW system to its full capacity?

7 Yes
2 No

Comments	**No. of Responses**
Training very thorough and good cross training.	1
The system was easy to use and anything not understood was taught until everyone understood the system.	1
The team that taught the class was very helpful to learning the systems.	1
But our training on the system is not complete. I am confident my team and this squad will be ready for the advanced case of AAEF.	1
More training.	1

9. Were there any safety issues or problems with any components of the FFW ensemble?

0 Yes
9 No

10. Are there any components of the FFW ensemble that you do not understand how to use, wear, or carry?

0 Yes
9 No

Still working on easier way to carry PDA. I find my cargo pocket is good and quick but probably not preferred for safety of PDA.	1
The new mouse is good; however, the buttons get pressed while it is stored in the vest; needs to have some sort of cover over the buttons.	1

11. Did you have any problems with the helmet-mounted display?

2 Yes
3 No
4 Did not use

Glasses do not work very well with the goggle-mounted display. I would still like to try a helmet-mounted display instead of the goggle-mounted display.	1
Goggle-mounted display needs to be on my dominant eye.	1

12. Did you have any problems with the PDA display?

3 Yes
1 No
5 Did not use

Comments	**No. of Responses**
I would like to have maps that allow you to zoom in a lot. Zoom should be about to 50-m grid squares. Only one map in the PDA could do that and our whole squad looked like one big icon. I couldn't see everyone's icon because it was crowded.	1
Sun glare blinds you from seeing the screen unless you wear sunglasses.	2
With wear and tear on screen, I see it being a problem in the future.	1

13. Using the scale below, please rate your understanding of the FFW system and your ability to use if effectively?

1	2	3	4	5	6	7
	←----------				----------→	
Don't understand most of the system and feel uncomfortable using it.	Some hesitation with some aspects of the system and slightly uncomfortable using it		No hesitation with most aspects of the system and becoming comfortable using it		Completely under-stand all aspects of the system and feel very comfort-table using it	

MEAN RESPONSE
5.89

14. What would you add to or change with the FFW system to make it better or more useful?

A push-to-talk and a mouse that you can mount on your weapon.	1
As we have been told, the weight of the leader's system is already in the works. So I would say the best thing is for the Army to pay for all infantry Soldiers' laser eye correction (the line is way too long).	1
Don't know at this time; need more time for it.	1
More durable cable connections.	1
Better, more detailed maps on the PDA. For example, the ones used on Garmin GPSs and maps that you can zoom in on very close.	1
Only thing I can think of right now is a cover over the mouse buttons.	1
Put GMD on dominant eye.	1

Appendix C. Future Force Warrior Training Phase: Land Navigation, Route Planning, and Waypoints

SAMPLE SIZE = 9

1. Using the scale below, please rate your ability to complete each task with the equipment you wore.

1	2	3	4	5	6	7
Extremely hard	Very hard	Hard	Neutral	Easy	Very easy	Extremely easy

	MEAN RESPONSE
Ease of leg movement	6.44
Ease of assuming the prone position	6.00
Ease of assuming the kneeling position	6.43
Ease of arm movement	6.44
Ease of torso movement	6.33
Ease of head movement	6.11
Ability to run	6.11
Use of hand and arm signals	6.71
Move through swampy or wet areas, small streams	6.22
Move through thick brush and vines	5.89
Ability to conduct individual movement techniques	6.25

Comments	No. of Responses
The chassis is 10 times better than the IBA. Range of motion is a lot easier and the weight (without ammo) is much lighter. It also allows your body to breathe so you don't over-heat. The moisture wicking shirt and the chassis itself help your body breathe.	1
The movement ability to walk, run, and kneel was very easy. Now the weight in the prone position is not so good, but that's in the works. Any infantryman should have no reason to think otherwise.	1
The total system is easy to use, but my GPS still doesn't work. Other than that, it is easy to use while using the system.	1
The two wires connected to the back of the helmet sometimes get caught up and prevent movement of the head. The wires just have to be shifted by moving my neck a certain way and I have free range of motion. This problem is not occurring all the time.	1
GPS icon was about 25 meters behind where I actually was. Voice commands were too picky (wouldn't recognize a command if I was breathing hard).	1

2. Using the scale below, please rate the problem areas encountered with the equipment you wore for this exercise.

1 2 3 4 5 6 7

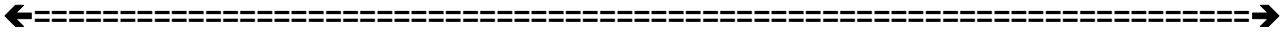
A lot of problems A few problems No problems encountered

	MEAN RESPONSE
Pressure points	5.89
Hot spots	6.44
Bruising	6.33
Torso (truck) chaffing in front	6.78
Torso (truck) chaffing in back	6.89
Arm/shoulder chaffing	6.78
Leg/thigh chaffing	6.78
Neck/head chaffing	6.78
Equipment snagging or entangling	5.33
Equipment hindering movement	6.00
Excessive weight shifting	6.44
Equipment pinching	6.33
Armor preventing flexing	6.22
Ability to adjust load and how it rides	6.11
Access to stowed items	5.44
Ability to breathe	6.22
Overall comfort	5.89

Comments	**No. of Responses**
System is far better than any other system I've used.	
At this time, I have not found a problem with the system.	1
Chassis definitely allows your body to breathe so you don't over-heat, and it doesn't crush my chest so I can expand my chest as much as I need to breathe.	1
The stowed items on my hip are a little hard to get in and out of the pouches.	1
My armor is too tight; hard for me to breathe. It has been brought up and I'm waiting on my large set.	1
Now, for about three days we have been wearing this equipment. Everyday my body is adjusting to bear the weight. So it takes some getting used to, but no problem there. The only problem I am having with this system is the GMD.	1
Somewhat heavy and bulky trying to move through thicker brush.	1
The mouse and goggles are hard to get (used) to.	1
I had problems with the wires snagging that might be a problem with stowing them though.	1

3. Using the scale below, rate the level of pain or discomfort (if any) you experienced with the equipment you wore for this exercise.

1 2 3 4 5 6 7



Extremely painful Moderately painful No pain at all

	MEAN RESPONSE
To your upper back	6.22
To your lower back	6.33
To your neck	6.56
To your head	6.11
To your torso (front)	6.44
To your groin	6.56
To your legs	6.89
To your arms	6.67
To your eyes	6.44

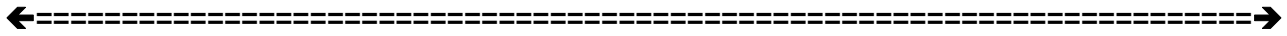
Comments	**No. of Responses**
So far on what we have done, I think this is a great system.	1
It's only the weight, and I get this heat spot on the back of my skull, but whatever, I'm infantry. I'll suck it up.	1
I just don't like SWD goggles.	1
Looking from the computer monitor back to the terrain, it was sort of hard for my eyes to focus going back and forth.	1

4. What is the method you most commonly used for land navigation?

	Number of Responses
Compass map	4
Compass only	0
Map only	1
Army-provided GPS	0
Commercial GPS	1
Other	2

5. Using the scale below, compare your ability to navigate and move cross country using the FFW system with your baseline method of land navigation.

1 2 3 4 5 6 7



FFW is much more difficult than Baseline | FFW is about the same as Baseline | FFW is much easier than Baseline

	MEAN RESPONSE
FFW versus Baseline	6.33

6. **Goggle-Mounted Display (GMD) Questions**:

a. Did you have any difficulty looking down at the ground while walking and wearing the GMD?

1 Yes
6 No
2 NR

Comments	No. of Responses
It is not the GMDs. It is my glasses' inserts. That's what stinks (my glasses).	1
The bottom of the goggles gets in the way.	1

b. Was the GMD distracting?

1 Yes
5 No
3 NR

It's right in front of you.	1

c. Do you like the GMD concept?

5 Yes
1 No
3 NR

Very, very useful. I am lost for words when it comes to this FFW system. Excellent.	1
It is 100% easier now.	1
I do like it even though somewhat distracting. It's nice to be able to see where I am on a map instead of taking the time to actually try finding myself on a regular map.	1

Comments	**No. of Responses**
The GMD is pretty helpful. Also you can look at where you need to go and take off the GMD to get some air and it will still track my position and direction. I wish it could be a swivel instead of a goggle.	1
I don't use it on this test but I use it with the pack bot.	1
The goggles can be moved to the helmet when you are not using them, but I have yet to find a pair of goggles that do not fog up, even with a fan mounted in them. I would still like to try a flip up, or to the side display.	1

7. **Voice Control Question:**

d. Did the system voice control work adequately?

5 Yes
1 No
3 NR

The only problem I had was with the zoom-in feature. Every other time I use the zoom in, it zooms out. Other than that, the system almost worked flawlessly. It made it much easier to use. It made entering grids very easy.	1
Things had to be said almost perfectly, making it hard to give commands when out of breath.	1

8. **Troubleshooting Questions:**

e. Were you given a troubleshooting chart?

8 Yes
1 No

It is easy to use.	1
If it is not on the troubleshooting chart, it is beyond my knowledge.	1

f. If you had a troubleshooting chart, was it adequate to identify the problem with your system?

8 Yes
1 No

Comments	**No. of Responses**
The troubleshooting chart should be written in "grunt" terms. It is easy to figure out but I think it can be broken down easier so that we don't miss a cable connection or not know what cable goes to what.	1

g. Would it be better to have the troubleshooting chart built into the FFW operating software?

4 Yes
5 No

I don't know. That could be a yes or no answer. There is enough information being updated onto the system.	1
It would be nice so you won't lose the chart for the enemy could find it.	1
No, because if it's the software not operating or you can't get power to the system, you can't troubleshoot it.	1
Some things on the troubleshooting charts require you to take off the system. It's just as fast, maybe faster to just pull out a chart.	1

9. **Route Planning and Waypoints Questions:**

h. Using the scale below, compare your ability to use the FFW system with your baseline method in terms of planning your land navigation route, and establishing and using waypoints.

1 2 3 4 5 6 7

FFW is much more difficult than Baseline — FFW is about the same as Baseline — FFW is much easier than Baseline

	MEAN RESPONSE
Planning your land navigation route	6.33
Establishing and using waypoints	6.00

i. Were you able to use the planned route on this exercise?

8 Yes
1 No

I use the PDA and once all the plots are put in, then we discussed which way we wanted to go.	1

Comments	**No. of Responses**
Shows your icon and lets you see if you're drifting right or left and how far.	1
Soldier system does not have a route planning system. I could only use entity to navigate by. I think the Soldier system should have it because any Soldier in the squad could be called on to land nav the squad.	1

j. Were you able to use the waypoints on this exercise?

6 Yes
3 No

I used the Soldier system.	1
It would be easier to use the waypoints if you were able to get continuous updates of distance and direction to the waypoint instead of just a line from one waypoint to another. So you would just have an option to select the waypoint and it gives you updates.	1
C2 MINCS system no waypoints you have to put an entity.	1
The distance was close and we knew exactly the direction to go.	1

k. Did any of the equipment you wore hinder your ability to complete the mission?

1 Yes
8 No

My GPS still is down.	1

l. Did any of the equipment you wore present an unsafe condition?

1 Yes
8 No

m. Did any of the electronic components or wires interfere with your ability to carry your normal fighting load, e.g., ammo, water, weapons?

1 Yes
8 No

So far, it seems like everything was placed in a great place.	1
I would normally carry more water than one hydration system. There really isn't any room to put a 1-quart canteen.	1
We have not yet carried our basic load.	1

10. During this exercise, you moved cross country, planned your routes, used waypoints, and wore the FFW chassis and equipment for an extended period of time. Using the scale below, compare your ability to use the FFW system with your baseline method in terms of completing these activities.

1 2 3 4 5 6 7

FFW is much more difficult than Baseline | FFW is about the same as Baseline | FFW is much easier than Baseline

	MEAN RESPONSE
FFW versus Baseline	6.33

Appendix D. Future Force Warrior Training Phase: Night Ambush

SAMPLE SIZE = 9

1. Using the scale below, please rate the degree of difficulty with TASKS IN THE PLANNING PHASE of this night patrol and ambush.

1 2 3 4 5 6 7

←==========→

Much more difficult than Baseline | About the same as Baseline | Much easier than Baseline

	MEAN RESPONSE
Receive the OpOrd or FRAGO	6.22
Route planning using the FFW system	6.89
Selection of RPs (rally points) using the FFW system	6.67
Selection of intermediate objectives using the FFW system	6.56
Selection of potential ambush points using the FFW system	6.44
Selection of objectives using the FFW system	6.44
Formulating your plan	6.56
Team participation in formulating the plan	6.00
Transmitting the plan over the FFW system to all squad members	6.63
Understanding the plan as seen on the FFW system	6.75
Sending changes to the plan while in route	6.62

Comments	No. of Responses
A very useful and vital option for every team and squad.	1
My personal leader system was not in use yesterday due to my goggles being down. Most of the input in planning was just things I observed.	1
Using topographic maps on the FalconView would have helped more. Or having a more detailed aerial photo map.	1

2. Using the scale below, please rate the degree of difficulty with TASKS WHILE CONDUCTING THE PATROL AND ACTIONS ON YOUR OBJECTIVE.

1 2 3 4 5 6 7

←==========→

Much more difficult than Baseline | About the same as Baseline | Much easier than Baseline

	MEAN RESPONSE
Transmitting changes to the plan	6.50
Receiving and understanding changes to the plan	6.38
Understanding signaling of enemy sightings	6.43
Walking through rough terrain with the goggle mounted display and the PVS-14s	4.83
Using the voice-activated controls during movement	5.83
Using the voice-activated controls during contact with the enemy	5.50

Comments	**No. of Responses**
Very helpful for getting situational awareness instantly through the team/squad.	1
Goggle just fogged up and I lost my icon for a minute or two.	1
Having every squad member with a radio definitely helped when changing the plan. I have the Soldier system and something that would help the Soldier system is having the entity that I put on my system stay there until I erase it or change it.	1
Still would like to have a topographical map to look at with the satellite image.	1

3. Using the scale below, please rate the degree of difficulty in maintaining SITUATIONAL AWARENESS during the night patrol and ambush.

1 2 3 4 5 6 7

←==========→

Much more difficult than Baseline | About the same as Baseline | Much easier than Baseline

	MEAN RESPONSE
Knowing your location at any given time	6.50
Knowing your team members' location at any given time	6.63
Knowing what the squad's mission was at any given time, even if it changed while in route	6.29
Communicating with your team members	6.78
Knowing what the enemy was doing	6.00
Knowing the enemy's location	6.33
Forecasting what the enemy was about to do at any time	6.50

Comments	No. of Responses
Complete SA at all times as it was happening.	1
I can see my whole squad even when I lost my icon I still had SA on what was going on.	1
My situational awareness was very good as far as friendly forces. Reporting on enemy was better because of the radio. Also I personally like to keep the formation tight, but with this system I felt more comfortable keeping bigger dispersion.	1
The couple that I checked was due to good comms.	1

4. Did the goggle-mounted display emit enough light to compromise your position?

0 Yes
7 No
2 NR

Didn't work.	1
I am one of the Soldiers that wear glasses. They fog up faster.	1
It was, however, bright enough to take away my natural night vision in the right eye, so I basically had to rely more on the NVGs than usual.	1

5. Did the PDA display emit enough light to compromise your position?

2 Yes
5 No
2 NR

Didn't carry one.	1
I turned the brightness all the way down until I could barely see it and it still glowed enough to illuminate my face.	1
Night ambush and pulling out your PDA is not a good thing. Noise discipline and light discipline are most important in an ambush.	1

6. Did the goggle-mounted display interfere with your ability to move over rough terrain at night while wearing the helmet-mounted PVS-14?

3 Yes
2 No
4 NR

Comments	No. of Responses
Everything fogged up so it was hard to reposition everything so I could see.	1
Only because they began to fog up toward the end of the mission.	1
Fogged up and fan needs to be strong but should go to a swivel so you can continue to get air flow to your eyes.	1
When my glasses fog up, so do the GMDs. Once either fog...my ability to use PVS-14s is also out the window. I'm blind.	1
I don't wear it though.	1

7. Were you able to use both the PVS-14 and the goggle-mounted display at the same time?

4 Yes
2 No
3 NR

Lack of air flow, goggles fog up and lost icon.	1
Until everything fogged up.	1
Didn't use the GMD.	1

8. Were you able to use both the PVS-14 and the PDA at the same time?

3 Yes
3 No
3 NR

It was fine; I had my other eye to use.	1
Did not carry PDA.	2

9. Did the PDA interfere with your ability to move over rough terrain at night while wearing the helmet-mounted PVS-14?

0 Yes
6 No
3 NR

Comments	**No. of Responses**
Movement was fine.	1
The PDA wouldn't work; it kept powering down.	1

10. What was the most difficult aspect of this mission to accomplish using the FFW system?

Everything was made easier.	1
It was rather easy to accomplish the mission. The only hard part was trying to see the monitor on the GMD after it fogged up.	1
I think the FFW system was responsible for the break in contact we had because the icons didn't update their location fast enough, but it also fixed it, too.	1
It was a little hard in the prone (position).	1
Just the goggles fogging up.	1
Radios can be more clear. I used the same type of radio last year. This year they are not as clear as they should be or can be.	1
Use the MFL while prone using the NVDs and the FFW screen. Most of the problem had to do with facing down a hill and looking up.	1

11. What was the easiest aspect of this mission to accomplish using the FFW system?

Movement to the objective. FalconView made movement a breeze and a whole lot easier to get the rest of your unit back when there is a break in contact.	1
Movement, setting into the ambush, establishing security, basically everything except part of the movement.	1
Planning.	1
Route movement.	1
Situational awareness.	1
Using the system.	1

12. If you could, what would you do to make the FFW system better?

Add a feature where you could select a waypoint and get continuous updates in real time of your bearing and distance to the target instead of walking along a line.	1
Change the goggles' pattern.	1
Get rid of the goggles and instead use an eyepiece that won't fog up.	1

Comments	**No. of Responses**
Make maps that zoom in more. Also the pen for the PDA should have a better place to store it. Every time I took out the PDA, the pen kept falling out of the back of the PDA and out of the pouch; luckily, I had it tied down.	1
My glasses are the only problem I have.	1
The weight.	1
The radios can be a lot more clear.	1

13. Using the scale below, please rate the degree of difficulty in accomplishing this night patrol and ambush mission with the FFW system as compared with your current (baseline) gear.

1 2 3 4 5 6 7

Much more difficult than Baseline | About the same as Baseline | Much easier than Baseline

	MEAN RESPONSE
FFW versus Baseline	6.44

It was much easier using FFW to plan and, for the most part, execute the mission than using our normal equipment.	1

INTENTIONALLY LEFT BLANK.

Appendix E. Future Force Warrior Training Phase: Training and the Use of Lasers

SAMPLE SIZE = 9

1. Using the scale below, please rate your ability to complete each task based on your training and use of the MULTI-FUNCTION LASER (MFL).

1	2	3	4	5	6	7
Extremely hard	Very hard	Hard	Neutral	Easy	Very easy	Extremely easy

	MEAN RESPONSE
Understanding the MFL controls	5.89
Using the MFL controls	6.11
Acquiring targets with the MFL	6.22
Holding the MFL on target	6.11
Transferring target data into the FFW system	6.00
Identifying targets placed into the FFW systems by someone else	6.33
Identifying the target location after it was placed into the FFW system	6.11
Use of the targets placed on the FFW system in planning your actions	6.22

Comments	**No. of Responses**
Good piece of equipment and would love to take to theater.	2
The MFL is a great tool for maximizing fires.	1
Using the MFL is too easy.	1
It followed the KISS (keep it simple, stupid) principle, which is a good thing.	1
Had troubles with the system, wire problems mostly. Have seen it work though and would be a great asset to have.	1

2. Using the scale below, please rate the problem areas encountered learning to use and in subsequently using the MFL.

1	2	3	4	5	6	7
A lot of problems			A few problems			No problems encountered

	MEAN RESPONSE
Learning to use the MFL	6.22
Using the MFL	6.44

Comments	**No. of Responses**
Learning to initially set the MFL up was not the easiest thing but once you get it down, it is fairly easy.	1
It was hard at first but the more I used it, it became rather easy.	1
No problems but good on planning.	1

3. Did you find the MFL easy to use?

9 Yes
0 No

Planning good.	1
The MFL is a good target acquisition system.	1
Very easy to learn and use.	1
It was hard at first but the more I used it, it became rather easy.	1

4. Would you use the MFL in a hostile fire area (combat)?

9 Yes
0 No

Give a more accurate range on some targets and make it easier for targeting using different weapon systems.	1
Yes, because it is at the least 70% solution if not 99% solution to having accurate call for fire.	1
You could use it for call for fire.	1

5. Using the scale below, please rate your ability to complete each task based on your training and use of the XM-104.

1	2	3	4	5	6	7
Extremely hard	Very hard	Hard	Neutral	Easy	Very easy	Extremely easy

	MEAN RESPONSE
Understanding the controls of the XM-104	6.11
Using the XM-104 controls	6.22
Acquiring targets using the XM-104	6.00
Holding the XM-104 on the target	5.89
Transferring target data into the FFW system	6.00
Identifying the targets placed into the FFW system by someone else	6.22
Identifying the target location after it was placed into the FFW system by someone else	6.33
Using the targets placed into the FFW system in planning your actions	6.44

Comments	**No. of Responses**
Don't get targets all the time from the MFL due to technical problems.	1
Easy to use and understand.	
The XM-104 used with the MFL are a great asset to ground troops' firing in a non-line-of-sight situation.	1
The buttons take some getting used to when not looking at the labels (try to scroll down and accidentally hit laser) but overall very easy to use.	1
It was easy to learn and use. But since I am an automatic rifleman and not a grenadier, right now I wondered if the XM-104 could be calibrated to be used with the .50 cal and M240 for plunging fire.	1

6. Using the scale below, please rate the problem areas encountered learning to use and in subsequently using the XM-104.

1 2 3 4 5 6 7

A lot of problems A few problems No problems encountered

	MEAN RESPONSE
Learning to use the XM	6.22
Using the XM	6.33

It is a very good tool and would be very useful in combat.	1
Very simple.	1

7. Did you find the XM-104 easy to use?

8 Yes
0 No
1 NR

Hard at first but it is easy to use.	1

8. Would you use the XM-104 in a hostile fire area (combat)?

9 Yes
0 No

Comments	**No. of Responses**
Don't have to put yourself where your target can see you but still can take the target out.	1
It would be a very useful tool in combat.	1
Yes, because it is at least a 70% solution.	1
Yes, I can zero in on the target from the MFL and I can be 300 to 500 meters away, depending on the capabilities of the weapon.	1

INTENTIONALLY LEFT BLANK.

Appendix F. Future Force Warrior Training Phase: Reconnaissance and Defense

SAMPLE SIZE = 9

1. Using the scale below, please rate the degree of difficulty with TASKS IN THE PLANNING PHASE of this point recon and defense mission.

1 2 3 4 5 6 7

←==========→

Much more difficult than Baseline | About the same as Baseline | Much easier than Baseline

	MEAN RESPONSE
Receive the OpOrd or FRAGO	6.22
Route planning using the FFW system	6.67
Selection of RPs using the FFW system	6.56
Selection of intermediate objectives using the FFW system	6.67
Identification of danger areas using the FFW system	6.78
Selection of objectives using the FFW system	6.67
Formulating your plan	6.78
Team participation in formulating the plan	6.44
Transmitting the plan over the FFW system to all squad members	6.67
Understanding the plan as seen on the FFW system	6.56
Sending changes to the plan while in route	6.33

Comments	**No. of Responses**
FFW made planning, movement, and situational awareness easier and faster.	1
Planning the mission was easier and smoother than would have been with map and protractor.	1
It saved a lot of time.	1
My squad understood everything on the FFW and plan.	1
Sending changes to the plan usually involves using the thumb drive. It would be easier if we could send it over the radio waves. I don't know if it is possible or not.	1

2. Using the scale below, please rate the degree of difficulty with TASKS WHILE CONDUCTING THE RECON AND DEFENSE MISSIONS.

1 2 3 4 5 6 7

Much more difficult than Baseline | About the same as Baseline | Much easier than Baseline

	MEAN RESPONSE
Transmitting changes to the plan	6.44
Receiving and understanding changes to the plan	6.56
Understanding signaling of enemy sightings	6.67
Lasing potential targets using the XM-104	6.57
Lasing potential targets using the MFL	6.75
Receiving and understanding targets applied to the system by the XM-104	6.25
Receiving and understanding targets applied to the system by the MFL	6.78
Notifying grenadiers to fire on laser-identified targets	6.56
Firing M203 on lased targets (using sighting system, holding it on the target, etc.	6.89
Using the voice-activated controls during movement	6.89
Using the voice-activated controls during contact with the enemy	6.67

Comments	**No. of Responses**
Actions in route were smooth and effortless.	1
Couldn't see targets "lased" because icon froze and had to restart computer.	1

3. Using the scale below, please rate the degree of difficulty in maintaining SITUATIONAL AWARENESS during this recon and defense mission.

1 2 3 4 5 6 7

Much more difficult than Baseline | About the same as Baseline | Much easier than Baseline

	MEAN RESPONSE
Knowing your location at any given time	6.67
Knowing your team members' location at any given time	6.67
Knowing what the squad's mission was at any given time, even if it changed while in route	6.56
Communicating with your team members	6.67
Knowing what the enemy was doing	6.44
Knowing the enemy's location	6.22
Forecasting what the enemy was about to do at any given time	6.22

Comments	**No. of Responses**
It helps a lot because everyone is on the same sheet of music.	1
SA was constantly and easily identified.	1
Lost situational awareness (SA) and had to reboot system to get SA for the second time.	1
The only problem with the location of myself and fellow team leaders was the 30-second delay.	1

4. Did you have any problems with the goggle-mounted display (GMD) on these missions?

6 Yes
1 No
2 NR

As soon as I stop, the goggles fog up.	4
Day 1 my GMD was not working at all.	1
The compass read 2 no matter what direction I was facing.	1
The mouse would not move to the right, and the display would get dark then go back to normal and kept doing so.	1
My eyes need air. I don't like any thing covering my eyes, or they can make the fan a little better.	1

5. Did you have any problems with the PDA display on these missions?

2 Yes
5 No
2 NR

Did not use the PDA.	2
PDA data filled up during recon and caused C2 MINCS to shut down.	1
The buttons need to be able to be locked out for when you stow it in a pouch.	1

6. Did the GMD interfere with your ability to move over rough terrain during these missions?

0 Yes
7 No
2 NR

Comments	**No. of Responses**
It actually helped; it kept me moving in the right direction and I was able to find an easier route through the swamp. Didn't need to check a compass every 30 seconds.	1
Lost SA but still knew where I was going thanks to the radio.	1
Only when they fogged up.	1

7. What was the most difficult aspect of this mission to accomplish using the FFW system?

Locating the enemy for the ones caring the MFL was easy; they could just "lase" it and everyone knew where it was. If everyone in the squad had an MFL, you could know what everyone is seeing.	1
Nothing was really very difficult.	1
Once in position, I had trouble seeing with the GMD.	1
Once we get to the ORP and stop movement for a while, the goggles will fog up. So movement up to OBJ and actions on was the most difficult.	1
Saving data after putting the information on the thumb drive to send to the other leader systems.	1
The goggles and lost my icon for 40 min.	1

8. What was the easiest aspect of this mission to accomplish using the FFW system?

Everything else. Enemy location, friendly, movement, planning, route.	1
Movement to the objective got much easier.	2
I had comms with everyone and at the same time I could see them, too.	1
Land navigation and movement to the ORP.	1
Radios.	1
The attack, using the XM-104 with targets "lased" from my team leader we would have taken the OpFor out in one shot.	1
Walking with the FFW system and "lasing" targets.	1

9. If you could, what would you do to make the FFW system better?

A flip screen from the helmet and a mouse on the weapon.	1
Get my eyes corrected with laser; this system is not for Soldiers with glasses.	1
Get rid of the goggles and have live up-to-date bearing and direction changes to any waypoint that I want information from. Also more options for changing routes and editing waypoints.	1
Goggles make a swivel like the land warrior; that way your eyes are free and they are not bogged up.	1
I would put a button-lock on the PDA. Every time I put it in my pouch and take it out, something has opened or the PDA has turned off.	1
If the PDA could be mounted on your forearm.	1
Make the voice commands able to understand different voices/accents, change the mouse, and use a different display instead of the goggle-mounted one.	1

10. Using the scale below, please rate the degree of difficulty in accomplishing these recon and defense missions with the FFW system as compared with your current (baseline) gear.

1 2 3 4 5 6 7

←==========→

Much more difficult than Baseline — About the same as Baseline — Much easier than Baseline

	MEAN RESPONSE
FFW versus Baseline	6.56

Nothing was really difficult.	1
It saves a lot of time so it speeds up the mission.	1
Just make goggles better.	1

Appendix G. Future Force Warrior Training Phase: Mission Planning and Troubleshooting

SAMPLE SIZE = 9

1. Using the scale below, please compare your ability to plan tactical missions and to communicate your mission plan within the squad using the FFW system with your baseline method.

1 2 3 4 5 6 7

←==========→

FFW is much more difficult than Baseline | FFW is about the same as Baseline | FFW is much easier than Baseline

	MEAN RESPONSE
Planning tactical missions	6.56
Communicate your mission plan within the squad	6.33

2. What was the most difficult aspect of the mission planning phase to accomplish using the FFW system?

Comments	No. of Responses
I didn't find anything very hard to use at all, fairly easy over all to learn.	2
Keeping it detailed but not cluttered.	1
Not being able to see the elevation and plan a route due to no topographic maps.	1
The most difficult part would be ensuring everyone has the same info on their system and I like to have face-to-face contact with my squad leader as he briefs the plan.	1

3. What was the easiest aspect of the mission planning phase to accomplish using the FFW system?

All of it, most things are self explanatory.	1
Entering data.	1
Everyone will have a good concept of ops because of the imagery.	1
Plotting points routes, objectives, etc.	1
Time, speed and comprehension of the plan are much easier.	1

4. Were you given a troubleshooting chart?

9 Yes
0 No

5. If you had a troubleshooting chart, was it adequate to identify the problem with your system?

8 Yes
0 No
1 NR

6. If no, why was it inadequate?

NA.

7. Did the troubleshooting techniques allow you to better identify the problem(s)?

9 Yes
0 No

8. If no, why didn't the troubleshooting techniques help?

NA.

9. Would it be better to have the troubleshooting chart embedded into the FFW system operating software?

4 Yes
5 No

Comments	**No. of Responses**
Because if the system has no power or the software is messed up, you got no troubleshooting.	2
Place it in the memory joggers but have a separate sheet in case the system doesn't work at all.	1
There is so much information already, to add more only adds more.	1

Appendix H. Technical Notes From Engineering and Support Staff

SAMPLE SIZE = 9

1. How long does it take to put a FFW system together in preparation for use by the Soldiers and what are the problems encountered?

Comments	No. of Responses
5 to 10 minutes. Mostly battery swapping and powering on the computer/PDA and the radio.	1
Initial assembly is a 1.5- to 2-hour process. Cable routing is the most significant problem. Current system is a bit more simple than the OTM (on-the-move) system. Radios must be preconfigured--not Soldier business to complete. Once assembled, daily checkouts appear to be 10 to 12 minutes per system.	1
When all systems are up and running, it takes two techs 30 mins to get them up and running. In 2 weeks, this case (all up and working) has occurred 1 to 2 times. When a system is bugged, it usually takes 30 min to 1 hr per suit for one tech to debug.	1
30 minutes to have the whole squad up and running.	1
2 hrs for nine systems to do a full network flush-out.	1
Problems not seeing SA data; radio is not configured due to new push by ITT[3].	1
A lot for 1 hour to boot up system. PCI (pre-combat inspect) the application and identify areas for troubleshooting. Turn on radios, new batteries, turn on computer, etc.	1
From observation only, it takes about 2 hours to set up a squad to walk out the door for training/mission.	1

2. How long does it take to power up the FFW system and what are the problems encountered?

Comments	No. of Responses
10 minutes (6 mins for radio, 4 mins for computer). The computer can have an issue with the FalconView route server and initialization can be an issue.	1
10 minutes from the time the system is turned on for all capabilities to work: GPS, radio in net, SA, XM-104, and MFL, provided everything turns on properly.	1
Power up from a cold start is 5 to 7 minutes. Radio start up, acquisition of GPS location, then acquisition of SA (network) are the most, maybe only, complex aspects.	1
Power takes 10 to 15 min for one to two techs to power-up all nine systems. No major problems in power-up so far.	1
Three minutes to system check the leader's system. Even less time for Soldier. For full system nine-man squad 1 hr for complete system check.	1

Comments	No. of Responses
It takes 5 minutes to get everything running on one system. The only system we have problems with is the Soldier variant. Some of them have a hard time getting SA.	1

[3]International Telephone and Telegraph (no longer used)

Takes 5 minutes for the radio to acquire network/GPS. Turn on computer at the same time, within 10 minutes you should know it you are in network or have GPS.	2

3. How much time does it take to recharge the battery systems?

3 to 4 hours to charge two batteries. The 8 charger can only charge two batteries at a time. It is an overnight process for all eight.	1
Not sure for leader or PDA. Both require support equipment – chargers or adaptors.	1
Not sure – overnight.	1
With the current eight chargers, it takes 8 hrs to charge eight batteries.	1
I do not know the exact hours required, but we leave them on the charger all night.	1
Anywhere from 2 to 4 hours; all batteries do not charge at the same pace.	1
Eight batteries = 7 hrs.	1

4. How long does the charge last on the systems batteries?

Leader – 8 to 10 hrs (with two batteries).	3
Soldier – over 12 hrs with two batteries.	2
Soldier system radio, 8+ hours and PDA 8 hrs.	1
PDA – Soldier system 12 to 18 hours. Leader's system – 3 hrs internal, 5 hrs external battery – most likely much less for grenadier system with XM-104 attached.	1
With dual batteries, the systems (both leader and Soldier) last 10+ hours.	1
Over 10 hrs leader possible 16 hrs for radio Soldier variant.	1
Recon only lasts 6 to 8 hours.	1
C2 Mines – 8 to 10 hrs/ PDA stand alone 8 hrs.	1

5. How long does it take to get the radios functional at the beginning of each day and what are the problems encountered?

Comments	**No. of Responses**
The radio boot-up takes about 6 mins. Next, it must join the network which can take up to 2 mins. If it does not, you must check the vehicle to make sure the slice pod island head is up and operational. Finally, you must bring the system outside so it can acquire a FPS fix which can take another 5 mins. All in all, it should be a 15-min process max. Once the Soldiers saddle up, a quick commo check should be done.	1
Once systems are configured, it is a 5-minute start up per radio. Configuration is complex, too many steps and windows to check. Seems to require 2 to 3 hours to get it right.	1
Radios take 5 to 10 min each day to power. On days with a radio software push (from test bed team), it takes an extra 2 hrs to reconfigure all nine radios for FFW. So far we average 1 to 2 pushes over 7 to 10 days.	1
20 minutes. Problem sometimes headsets don't work properly and other cables become unseated and stop the radio from functioning properly.	1
At least 15 minutes to acquire GPS.	1
5 to 10 minutes; sometimes we have a hard time getting SA.	1
5 to 10 minutes if the island head is turned on and we get in network.	1
Less than 5 minutes if no anomalies encountered.	1
With every radio push, new problems seem to be encountered.	1

QUESTIONS RELATING TO DAILY POST-OP ACTIVITIES

6. How long does it take to inspect the system for problems or failures?

Comments	No. of Responses
10 to 15 mins. If there is an obvious problem, it is almost instantaneous.	1
10 to 15 minutes with the proper checklist for the user.	1
The simple PCI takes 3 to 5 minutes. If troubleshooting of simple problems is encountered, add 10 minutes.	1
Time varies from 5 to 10 min for easy-to-detect failures to 5+ hrs for hard-to-detect failures.	1
An easy fix takes from 5 to 20 minutes, depending on how far you have to troubleshoot. Restarting the CF-18 and the radios takes the longest.	1
Depends on report issues; commo could be (as participated in) 30 minutes to 1 hr	1
1 to 5 minutes, depending on how well you know the system.	1
Cursory check a matter of minutes, plus power-up time to trace a problem indeterminate.	1

7. What is failing?

a. On the helmet?

No real issues.	4
Maybe the audio cable.	1
Microphone and bone conduction headset become loose.	1
GMD wire.	1
Bone conduction headsets are easily breakable.	1
So-so on sweatband comfort.	1
HMD.	1

b. On the chassis?

The cabling on the chassis can be suspect.	1
Closing the chassis still is difficult for some.	1
The back of the chassis are moving and making the chassis uncomfortable for Soldiers.	1
Cables for data voice, USB (universal serial bus) can become frayed.	1
MFL cables break.	1
Cables for the quick release that run along.	1
Push-to-talk.	3
Need more modularity.	1
Missing parts for one grenadier to use XM-104.	1

Comments	**No. of Responses**
The shoulder connection screws. Must be checked. "Lock tight" required if loose.	1
Nothing yet; anticipate the bolts that hold it together already noticing loosening.	1
PDAs.	1

c. On the electronics?

The goggle display is most troublesome.	1
Goggles are breaking; cables; moisture in the display (GMD); too much fogging of the display.	1
Connectors, mouse, radios, PDA network cords. Not aware of other specifics.	1
PDA is over tasked.	1
PDA loses SA intermittently.	1
Cables to all electronics are not hardened enough. GMD to CF18 is the most sensitive.	1
Cables and GMDs and the recon; also, the mouse.	1
GMD mounting plate wire.	1
Software configurations have to be maintained/fixed; recon PDAs have very low reliability and fail frequently. Goggles/mouse have failed frequently (almost 50% failures for each).	1
Recons – 90% of the time don't make it more than 3 hrs.	1
Icons on leader system redraw so that they disappear for 10 to 20 sec then come back.	1
Cables and connectors.	1
Various software glitches.	1

8. How much time does it take to correct problems and/or fix malfunctions on a daily basis?

No problem; takes over an hour or so to correct.	1
On average, each system has about 30 to 45 minutes of malfunctions during the training period.	1
Not sure on a daily basis. Have observed both simple (1-minute fixes); reboot fixes (5 to 7 minutes), and troubleshoot – take it back to the trailer fixes (20 minutes and gone for the day).	1
Across all nine systems, the tech team (usually three people) averages 4 to 6 hours a night to fix.	1
It varies; on issue sometimes have to think about it overnight.	1
At this time, most minor fixes with a tech at the user level are 10 minutes.	1
Reboot, reset card, inspect and/or change cables trends have been established and the normal fixes are quick.	
A couple of hours after to systems are turned in by the Soldiers, to make it ready for reissue.	1

9. What needs to be hardened?

Comments	No. of Responses
Cables and connectors are primary areas.	5
Electronic component mounting is secondary.	2
Everything!	1
Everything except the MFL-CF18.	1
Push-to-talk.	1
Display.	1
All connections to CF-18.	1
Mouse needs to be redesigned and provide full functionality or weatherproof the speedball mouse.	1
PDAs and PDA Ethernet cards are not reliable.	1
MFL cables/XM-104 cables – all other system cables; audio amplifier.	3
All external wiring; mouse, PDA tether/connector; bone conduction headset.	1

10. How many technical persons are required to maintain sufficient systems for a 9-man squad?

Minimum of three; ideally, five or six.	5
With current system, two to three.	1
Three to four; we need two techs per five leader systems; one dedicated tech for rifleman systems; and one hardware tech.	1
Three techs with an engineer; one commo guy.	1

11. What types of technical persons are needed to maintain the systems?

Software people, electronic techs, industrial designer, admin person to track changes.	1
Software and hardware specialists.	3
Not sure of skills required.	1
Two software/hardware techs for five leader systems; one software/hardware tech per four rifleman systems; one hardware tech for cables, physical wiring, etc.; one power tech to do battery/power mgmt. Currently, no one does this job today but someone scheduled to start on 10/16; and one lead tech to oversee operations, coordinate with network integration team, manage configs, etc.	1
SME on the system.	1
Technical persons who have been exposed to the system and are trainable.	1
Two Electrical; two software leads; one commo guy.	1
Network, software, and engineer to route cables, harden areas, etc.	1

QUESTIONS RELATING TO OPERATIONS AND FIELD MAINTENANCE

12. What problems are the Soldiers experiencing in the field with the systems?

Comments	No. of Responses
Computer software not responding, commo cutting out, LRF not responding, cables breaking.	1
Fraying of cables, fall off network, losing GPS data, minor software application failures.	1
Mouse freeze up; and connectors popping loose.	1
PDAs are not working; MFL are failing; lost GPS signals; lost voice comms; lost SA; BAO talk not working properly.	2
MFL cables failed; PDAs are unreliable – after 1 to 3 hrs of use, PDA network cards die; goggles fog or become fuzzy when cables pull; mouse failures.	1
Commo garbles (push-to-talk); reliability of all cables; reliability of recon PDA; onscreen keyboard caused a com port failure.	1
Dropping out of the net; PDA malfunctions; GMD cables.	1
Battery loss – after a full re-charge; need to reboot on some problems; garbled voice transmissions on some sites.	1

13. Of these problems, what can be fixed in the field?

None.	1
Software related items are usually solved by rebooting and reconnecting.	1
Cable breaks are not fixable.	1
MFL cables, goggles, mouse issues can be fixed rapidly with spare cables – but since there are no spares, these can't be fixed.	1
Losing connectors and problems requiring computer or radio reboot (5- to 7-minute issues).	1
Restarting computer; fixes BAO talk, and SA problems.	1
The net and PDA can be fixed quickly.	1
We have troubleshooting methods for all, when you reboot the radio, you will lose either SA of squad (keep your own) or lose radio. There are not spare cables to fix in the field.	1
Some require resupply.	1

14. Are the Soldiers troubleshooting problem areas correctly and adequately?

Yes, they have been improving steadily and fixing problems adequately.	4
Yes to the level of this training.	1
Those I have observed have been fixed in 5 to 7 minutes or take to the trailer for technical fix.	1
Problem areas Soldiers can fix are being corrected in the field by Soldiers.	1
They are using their checklist, so yes.	1

15. How long are the batteries lasting under field use?

Comments	No. of Responses
They are lasting well over 8 to 10 hrs.	2
Leader, 8 hrs; Soldier radio 8+ hrs; PDAs, 8 hrs.	1
Not sure on actual times.	1
10+ hrs for system batteries (leader system/Soldier radio); 8+ hrs for Soldier computer (PDA).	1
No failures to date.	1
Less than 4 hours.	1

16. Are Soldiers experiencing problems which they could repair or fix but they are relying on the techs and what are these problems?

Not really. Cables break and software malfunctions are tech fixes that need to be done off line. Soldiers are reporting problems correctly.	1
No.	1
Loose connections seem to be most common correctable by Soldier.	1
Not sure.	1
DSL (digital subscriber line) lost SA on FV; Soldier determined he was in net and rebooted; I think they troubleshot the issue; system worked.	1
They have been good about using their checklists. At first they relied on the training team and the techs; no they have an idea about it.	1
All that has been taught at this point to the Soldier can be fixed adequately.	1
Tech question to techs for their estimation.	1

17. Are problem areas easy to see/view or are they not visible to a quick inspection?

Most areas are. Cables are not that easy to troubleshoot.	2
In any given day, there are usually three to five minor problems that can be fixed quickly and one to three that are major and required 2+ hrs to debug.	1
Very few easy to see problems.	1
Some were easy to view but others not so much – software issues.	1
Hardware problems are more difficult than the software – in most cases.	1
Most problems are software or network related.	1

18. Are diagnostic tools sufficient for maintenance and troubleshooting?

For about 75% of fixes.	1
Not sure beyond Soldiers.	1
2 weeks ago, “no”; today for the most part now that more supplies have arrived.	1
No, we need a multimeter and ability to test loads on batteries.	1
Unknown for part of system.	1

19. If not, what diagnostic tools are needed?

Comments	**No. of Responses**
Some electronics specialty tools are required, e.g., DMM (digital multimodal), small-gauge wire tools.	1
Soldiers only need simple checklists.	1
We still need GPS antennas in the trailer to diagnose GPS issues.	1
A spare system to monitor SA/voice while Soldiers are training is most important.	1
Memory stats (usage).	1
Peripheral plug/unplug logs.	1
The ability with the flip of a switch to run diagnosis/prognosis on entire system.	1

20. Are there any other areas of concern that you witnessed during this phase that need attention?

System reliability.	1
Software reliability.	1
No; all covered in questionnaire.	1
Recon PDAs are not as reliable as we hoped – recon Ethernet cards fail to often.	1
GMD (goggle mounted displays) fail too frequently.	1
Currently no one is tracking any equipment inside trailer or when issued to Soldiers – no staff on site, and techs too busy doing system upkeep to do this.	
No spare parts for most system cables, electronics. Any failures mean Soldiers can't have an operational system.	1
Last week a VIP demo interfered with Soldier training. It needs to be made clear that VIPs are welcome to see systems, but this shouldn't interrupt training.	1
Leaders are having mouse issues; need a better option in future.	1
Support personnel need to learn the system better. A device (MFL) should never have been sent. Learning the system will only make the support personnel able to help those on the ground better.	1
Having zero spare cables on the first day of training. Having engineers buy tools to do their job. People are exceeding their workload. People are straying from their jobs; overly concerned with broader issues or organizational issues. Not clear defined jobs on the ground. Understaffed or being pulled to work on issue not related to current job.	1
We need to get more supplies for the techs. They are doing a lot of good work without the proper spares.	
Spare parts; equipment control; need someone to know enough of everything and be the person to task organize solutions. This will need the FRAGO fix and allow everyone to stay lane focused.	1
Hardening/ruggedization of all electronics, cables, connectors. These are not holding up (expected) but no spares on site.	1
Squad SA goes away for 10 to 20 sec then redraws on leader systems.	1
PDA seems tapped out processing wise. This is believed to contribute to inter-mittent problems.	1
Architecture has single point of failure (SL). If SL system goes down, squad sees no blue SA outside itself and no one outside sees squad SA.	1
Use of non-2525B symbology.	1
Need to have additional tech support to keep system.	1
Check in – check out run smoothly.	1
Need spare parts.	1
Delay in receiving parts from outside.	1
Need credit card holder assigned to experiment.	1

Appendix I. Future Force Warrior Pilot Test Phase: Attack

SAMPLE SIZE = 9 (multiple iterations)

1. Using the scale below, please rate the degree of difficulty with TASKS IN THE PLANNING PHASE of this mission. Compare the ease or difficulty of each task with how you would normally do it with baseline equipment.

1 2 3 4 5 6 7

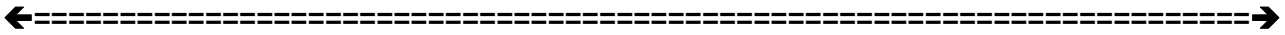
Much more difficult than Baseline — About the same as Baseline — Much easier than Baseline

	MEAN RESPONSE
Route planning using the FFW system	6.88
Mark TRPs (tactical rally points) with the FFW system.	6.69
Mark RPs with the FFW system.	6.75
Mark OBJ with the FFW system.	6.69
Brief the OPORD with the FFW system (SL and TL).	6.23
Conduct terrain analysis with the FFW system.	6.00
Conduct map recon with the FFW system.	6.35
Share overlays between FFW systems using thumb drives.	6.30
Conduct PCIs of all FFW equipment.	6.61

Comments	No. of Responses
Planning went smooth.	1
It makes it a lot easier and faster.	2
It is much easier to do map recon having both the topographic map and the satellite imagery.	1
Keep this drive going good and will take to theater.	1
Just the GMDs I don't like; everything else OK.	1
The only thing in planning that will help is a topographic map for map recon and terrain analysis.	1
We made up a new PCI checklist that incorporated all of our equipment to include the FFW system.	1
I have a Soldier's system so I don't do the planning.	1
Planning tasks are easy with the FFW but the reason I marked briefing the OpOrd low is because C2 MINCS does not have the same picture as FalconView and I think I get a better visual with a terrain model.	1

2. Using the scale below, please rate the degree of difficulty with TASKS ENROUTE TO THE OBJECTIVE. Compare the ease or difficulty of each task with how you would normally do it with baseline equipment.

1 2 3 4 5 6 7



Much more difficult than Baseline | About the same as Baseline | Much easier than Baseline

	MEAN RESPONSE
Determine your location using the FFW system	6.88
Determine the location of other squad members using the FFW system	6.88
Determine the location of friendly assets using the FFW system	6.41
Disseminate information using the FFW system	6.53
Issue FRAGOs using the FFW system (SL and TL)	6.18
Use the radio system for command and control	6.50
Land navigation using the FFW system	6.94
Use voice-activated controls during movement	5.88
Use voice-activated controls during contact with the enemy	4.67

Comments	**No. of Responses**
The system allows for continuous SA.	1
Great for situational awareness mostly within the squad.	1
Movement is much smoother with FFW and I also used my PDA to get SA during movement and in the ORP.	1
Just lost SA on friendly but still had a general idea of what and where the enemy were located.	1
Just the GMDs.	1
A lot of the voice-activated controls do not work ever. Some of them work some of the time, and some of them work all of the time. Center on me never works, zoom in and out works some of the time, and bringing up other window, on screen keyboard, waypoint.	1
Sharing information such as FRAGOS is a pain because we have to use the thumb drive to send overlays, so if a FRAGO comes up while we are on the move and I populate my system with the new graphics I have to save it to the thumb drive and give it to each one.	1
My map zoomed all the way out and I was unable to zoom back in so I didn't use it or the voice commands.	1
I don't use the PDA until we stop because I carry the SAW (squad automatic weapon); it would be easier if able to mount it on my forearm.	1
GMD is not very good during night movements. Completely takes away all vision.	1
Goggles fogged too easy and I could never get the ENVGs to work properly with the GMD.	1
Using voice-activated controls during movement is somewhat hard trying to locate the little icon. Haven't tried it during contact yet; I don't really think that is efficient.	1

3. Using the scale below, please rate the degree of difficulty with TASKS WHILE ON THE OBJECTIVE. Compare the ease or difficulty of each task with how you would normally do it with baseline equipment.

1 2 3 4 5 6 7

Much more difficult than Baseline | About the same as Baseline | Much easier than Baseline

	MEAN RESPONSE
Mark targets with the MFL	6.00
Send targets to squad members	6.57
Send targets to FBCB2	6.17
Send targets to Barebones	6.38
Send targets to XM-104	6.67
Conduct cooperative engagement between the team leader and grenadier	6.20
Use SA provided by FFW system to determine the location of Soldiers	6.76
Use SA provided by FFW system to determine the location of friendly assets	6.71
Use SA provided by FFW system to mark enemy positions	6.50
Use radios for command and control	6.47

Comments	**No. of Responses**
It makes it easier to locate someone rather than trying to walk around looking for them.	1
Just lost SA on Soldiers for about 1 minute or 2 due to trees but still had eyesight on friendly and enemy.	1
It is a lot easier but it would be better if we didn't have to push a button to activate SA to speak.	1
MFL was not working with the FalconView or bare bones systems.	1
No engagements were conducted using the MFL and the XM-104. The MFL worked perfectly during PCIs but in an attempt to pick up the rest of the platoon's SA in FalconView I logged off the system and logged back on and had a communications port 1 error so the MFL did.	1
Due to the OC's not letting us use 203's during AEF we don't have really any use for the 203 asset provided by the XM-104.	2
I used my PDA and radio on the objective. During the assault I was on the left flank for out squad and confused on the location of other friendly units and my team leader wasn't with me. So I used my PDA and found the squad that was on our left had shifted.	1

4. Using the scale below, please rate the degree of difficulty with TASKS WHILE ON MOUT OPERATIONS. Compare the ease or difficulty of each task with how you would normally do it with baseline equipment.

1 2 3 4 5 6 7

Much more difficult than Baseline | About the same as Baseline | Much easier than Baseline

	MEAN RESPONSE
Monitor GPS status of FFW system inside buildings	6.00
Monitor communications	6.73
Communicate in buildings	6.77
Monitor SA provided by FFW system	6.57

Comments	**No. of Responses**
Situational awareness once again is the greatest asset of this system.	1
It makes it easier to locate other members in the squad, to find out their status and where the enemy is located.	1
Just the GMDs.	1
During the night with the GMDs. It was so difficult to see that I could not walk around outside or inside with the goggles on. The mission lasted so long that the weight is getting to the point of weighing me down, and this isn't easy for me.	1
Really don't need GPS because this is when verbal takes place but GPS when still in tack.	1
Again no SA on the rest of our platoon just our squad.	1
Didn't use the radio much in the buildings, but when I did, it was hard to hear because of all the noise, even with the volume all the way up.	1
Did not go into buildings.	1
I died before entering any buildings.	1
The maps on the PDA need to zoom in more because when the squad is in one building I can only see one blue dot.	1

5. Using the scale below, please rate the degree of difficulty with TASKS WHILE ON NIGHT OPERATIONS. Compare the ease or difficulty of each task with how you would normally do it with baseline equipment.

1 2 3 4 5 6 7

Much more difficult than Baseline — About the same as Baseline — Much easier than Baseline

	MEAN RESPONSE
Use GMD and PVS-14 together	5.00
Use GMD and ENVG together	3.20
Use GMD while observing light discipline	4.60
Use PDA while observing light discipline	5.13
Use XM-104 under limited visibility	3.50

Comments	**No. of Responses**
GMDs need to have a swivels so your eyes can have a better sense around your area and your eyes want sweat due to the GMD's fogging up.	1
Too much light on the GMDs while using the ENVGs and really couldn't navigate through the woods so I took the GMDs and kept the ENVGs on so I can navigate. But I still used the GMDs once in a while to orient our movement.	1
GMD still fogging up.	3
Can't see through the regular sights (too dark) and the thermals are blocked by the front sight post, making them ineffective as well.	1
I used the PDA at night and with the brightness almost all the way down it was still lighting up my position.	1
The PDA puts out a lot of light so it is hard to use it at night.	2

6. What was the most difficult aspect of this mission to accomplish using the FFW system?

Just the GMDs.	1
Wearing the GMD.	1
GMDs fogging up.	1
Remembering to mark targets while on the mission, or taking the time to mark and send them. It is easy to do; I just have to remember to do it.	1
Using the GMD and the ENVGs together.	2
Trying to continually get up, move and get back down with all the weight.	1
Trying to aim at the enemy.	1
Trying to pull out the PDA while on the move when you're an automatic rifleman.	1
It weighs heavy on your hips, and in the prone (position) the system rides up so it is hard to be scanning your sector.	1
The radio communication. LT gave the OpOrd during the convoy movement; not a good idea because of my comms.	1

Comments	No. of Responses
My eyepiece in the GMD was on the wrong side and I wasn't used to it, so walking with the goggles on was difficult so I just kept them up until I needed the SA.	1
Movement because of the goggles.	2
Coordinating with the other squads that don't have FFW.	1
The most difficult was trying not to give our position away in the ORP while using my PDA.	1
Being able to pull out or get situational awareness using the PDA during the mission. All systems should be FalconView with goggle-mounted display.	1
FFW really doesn't have a place during the actual actions on the objective. When it comes to reconsolidation you can use it again.	1

7. What was the easiest aspect of this mission to accomplish using the FFW system?

Planning the routes.	7
Sectors of the squad.	1
Command and control of the squad during movement.	1
Navigating.	2
Knowing where everyone was at, plus being able to mark the cache site and know where it's at in comparison to everyone.	1
Flexibility.	1
Mobility.	1
Regaining connection with the squad after prior engagement with the packbot.	1
Confidence in where I am and friendly.	1
Comms, SA.	2
Marking friendly and enemy locations.	1
Movement to the objective.	2

8. What would you recommend to make the FFW system better?

Just the GMD's better.	1
Have gloves with the uniform.	1
Just the GMDs make swivel and have a cloth for the GMD's so they won't fog up as much.	1
A different display.	1
Get rid of the GMD.	1
Get rid of the goggles.	1
XM-104 needs to be smaller and lighter.	4
Should have better thermals or a night vision ability added in.	1
Move the thermal so it isn't blocked by the front sight post or give it a night vision capability in the regular rifle sight.	1
Not ride up while in the prone.	1
All members use a GMD and FalconView.	1

Comments	**No. of Responses**
GMD and FalconView for all members of the squads and allowing the FBCB2 to send to FalconView.	1
Find a way to stow the wires. I have a small kit and wires are everywhere it seems like.	2
PDA and FalconView should talk to each other better. Make all computer and electronic pieces more rugged.	1
Default grids should be MGRS we never use lat/longs. Plotting enemy should be done using direction and distance. The map should be a 1:50,000 scale map that can be zoomed into a 50-m grid square so that you can see the dispersion of the squad.	1
The platoon needs to use the FFW system instead of robots for on the ground recon. The reasons being it is so easy to send spot reports to FBCB2 and the MFL which makes this even easier.	1

9. Did any of the equipment you wore hinder your ability to complete the mission?

4 Yes
14 No

Just the pants needs zipper on the pockets so stuff will be more secured and more big pouches around the vest or belt.	1
I was worn out by the time I got to the third floor of the second bldg and there was still a lot more of the mission left to do.	1
While in the prone the vest tends to ride up on your body.	1
Weight.	1
I wish I could have used the GMD more, I just couldn't see.	1
The wires catching on things and hanging off me.	1
Goggles .	1

10. Did you have any problems with fitting (donning and doffing) the FFW chassis?

2 Yes
16 No

I finally got the right size and it fit like a glove.	1
You have to use the body system because of the sensitivity of the equipment, and weight.	1
We use the buddy-team method.	1
The kit for FFW is better than any I've worn in the past.	1
I got a large chassis and I had a medium to start out with. The large I found chafes the mid section a little more. I'm probably a size between medium and large.	1

11. Did you have any problems connecting the cables to power the FFW systems and radios?

0 Yes
18 No

Comments	**No. of Responses**
Since you guys fixed my MILES (multiple integrated laser engagement system) harness, I've had no problems.	1
It would be better if the cables coming off the helmet were longer, it would give me more range of motion with my neck and not get caught up.	1
MFL cable broke during the mission; needs to be hardened for field use.	1

12. Using the scale below, please compare the FFW system with your current (baseline) gear in terms of hindering or improving your ability to complete the mission.

1 2 3 4 5 6 7

Much more difficult than Baseline — About the same as Baseline — Much easier than Baseline

	MEAN RESPONSE
FFW versus Baseline	6.41

Appendix J. Future Force Warrior Experiment Phase: Offense Scenarios

SAMPLE SIZE = 9 (multiple iterations)

1. What was your specific mission today?

Comments	No. of Responses
Attack on OBJ Rockwell	2
Destroy enemy training camp and all enemy personnel on OBJ rock.	2
Attack on McKenna	9
Day attack on McKenna	2
Night attack on McKenna	1
Attack the IED factory in McKenna	1
Attack bomb making facility in McKenna	4
Take pictures of and blow up bomb making building	1
Attack OBJ Wadsworth	1
Defend McKenna	4
ME (map exercise) on the defense of McKenna	1
Attack on enemy training camp	2
Routes and navigate platoon to objective, and main effort for the platoon.	2
Defense of C4 of McKenna	4
Defend C4 the police station	2
Clear C-4 Quads 1 and 2 platoon ME	1
Attack C-4 to restore control of the government building.	1
Attack on government building to secure it and destroy all enemy personnel in order to restore order in the town.	1
Our mission was to attack government building C4, destroy all enemy and regain control of the town. And find the mayor and his assistant that are being held hostage in the mosque.	1
Attack on government building the ME	1
Attack on the government building. C-4	1

2. Using the scale below, please rate the degree of difficulty with TASKS IN THE PLANNING PHASE of this mission. Compare with how you would normally do it with the baseline equipment.

1 2 3 4 5 6 7

Much more difficult than Baseline — About the same as Baseline — Much easier than Baseline

	MEAN RESPONSE
Route planning using the FFW system	6.71
Select and mark TRPs with the FFW system	6.63
Select and mark RPs with the FFW system	6.65
Select and mark OBJ with the FFW system	6.76
Construct and brief the OPORD with the FFW system (SL and TL)	5.42
Conduct terrain analysis with the FFW system	6.14
Conduct map recon with the FFW system	6.58
Share overlays between FFW systems using thumb drives (memory sticks)	6.16
Sending and understanding the plan as seen on your PDA or GMD	6.20

Comments	No. of Responses
It is a lot easier and faster to give it.	1
It was difficult to send changes to the plan at the last minute because we didn't have enough time to take the memory stick from leader system to leader system.	1
Used the tablet to draw up the overlay during the OPORD. It was easy to do and it was passed out after the OPORD was given.	1
C2 MINCS and FalconView need to talk to each other to have common data. Getting the OPORD over the radio is very difficult; I would much rather do it face to face. A FRAGO would be different. A FRAGO I could get over the radio.	1
Briefing the OPORD is hard using the system. I still like the order to be briefed face to face with a terrain model.	1
PDA wasn't of much use during the mission; it was too quick to really check any SA.	1
PDA and planning really have no place. FFW cannot send overlays to the PDA and can't really get into the planning phase because of it.	1

3. Using the scale below, please rate the degree of difficulty with TASKS EN ROUTE TO THE OBJECTIVE. Compare with how you would normally do it with the baseline equipment.

1 2 3 4 5 6 7

←==========→

Much more difficult than Baseline | About the same as Baseline | Much easier than Baseline

	MEAN RESPONSE
Determine your location using the FFW system	6.40
Determine location of other Squad members using FFW system	6.50
Determine location of friendly assets using the FFW system	6.36
Disseminate information using the FFW system	6.47
Issue FRAGOs using the FFW system (SL and TL)	6.30
Use the radio system for command and control	6.47
Land navigation using the FFW system	6.53
Use voice-activated controls during movement	5.21
Use voice-activated controls during contact with enemy	4.40

Comments	No. of Responses
It was easy to coordinate defensive positions using the GMD's view and tie in with other units. I could see their locations but they had to confirm where we were by walking over to us. All I had to do was look in the GMD after I wiped the fog out of it.	1
FFW makes movements very smooth.	1
Couldn't determine my location due to rain or my GMD wasn't picking up SA and I had to scroll to find friendly and enemy and also SA of my squad.	1
Unfortunately my voice command didn't work this mission and I had to find my icon and friendly and enemy icon on FFW scroll to find them.	1
Voice command didn't work this time around and couldn't find SA until I had to scroll to find my SA.	2
We received intel from the FBCB2 on enemy locations. It showed up as red icons. We couldn't tell what the icons were just that they were enemy or possible enemy. All we had to do was listen on the radio for what the icons were and mark them.	1
All icons on the FalconView program, if they are not FFW, have a long ISP (internet service provider) address behind the FBCB2 which takes up a lot of the screen. If they could say something like TLA (team leader, A team) or GR (grenadier) like the FFW icons, it would take up a lot less space and would be a lot easier.	1
With the refresh rate set so slow it is harder to track ourselves for any given distance unless we are stationary for an extended period of time. The voice-activated controls are continuously getting worse. They need to have the ability to reset them.	1
5-minute refresh rate makes the system worthless, and I don't use the voice control because the clicking gets too annoying.	1

Comments	No. of Responses
Radio didn't work in the rain, continuous hot microphone; couldn't understand half of what others were saying.	1
Unplugged cord from headset and didn't use the voice commands.	1
I lost radio and had no comms.	1
I could barely see the screen through my GMDs.	1
Hard to pull out PDA during movement.	1

4. Using the scale below, please rate the degree of difficulty with TASKS WHILE ON THE OBJECTIVE. Compare with how you would normally do it with the baseline equipment.

1 2 3 4 5 6 7

←==========→

Much more difficult than Baseline — About the same as Baseline — Much easier than Baseline

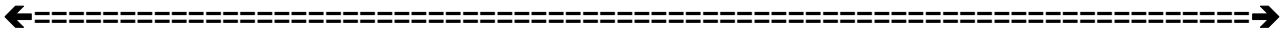
	MEAN RESPONSE
Mark targets with the MFL	6.83
Send targets to squad members	6.80
Send targets to FBCB2	6.64
Send targets to Barebones	6.50
Send targets to XM-104	6.67
Conduct cooperative engagement between the Team Leader and Grenadier	6.00
Use SA provided by FFW system to determine the location of Soldiers	6.53
Use SA provided by FFW system to determine the location of friendly assets	6.43
Use SA provided by FFW system to mark enemy positions	6.41
Use radios for command and control	6.58

SA was on point but I had to find my SA because voice command was inoperable.	1
Like I said earlier, couldn't find my SA because of the voice and I had to scroll left, right, up and down to find my SA because of the voice was inop and the radio was in and out maybe due to the weather.	1
Couldn't use SA due to rain or sticking in the computer but I turned the computer off, then reboot to see if I had SA but still didn't. I had to scroll to find where I was at to find my SA.	1
Couldn't find SA until I had to scroll to find myself.	1
I was asked by the PSG (platoon sergeant) to mark our position and send it to the FBCB2 so the CO (commanding officer) would get it. Bare bones would not allow me to put a symbol anywhere near our position that could be considered our reconsolidation area. It was great having the SA we had.	1
I lased 17 targets and sent three of them to FBCB2. One of the targets ended in a fire mission resulting in one enemy KIA (killed in action). It was easy to do, it's just taking a few seconds in the middle of a fire fight to do it. I will try and do it more often and coordinate.	1

Comments	**No. of Responses**
There wasn't really a need to use the laser based on the mission. We came across an op in the west but it was already templated on FBCB2. The SA was used while in the building to confirm where other friendly assets were.	1
Not allowed to use M203's so we can't test the cooperative engagement between XM-104 and MFL's.	1
Can't use M203's during AAEF so I can't test the capabilities/usefulness of the XM-104; however, the rifle sight in it works pretty well.	1
My team leader and I tested the cooperative engagement before we went on the mission, seeing as they won't let us use 203's on the mission, it worked quite well.	1
I lost SA on the objective.	1
Its hard to use the PDA while in movement.	1
I was killed when we got to the building.	1
Radios make it easier to talk to other team members and get SA on them.	1
Once we are engaged with the enemy I will use voice commands, and the radio to send up reports to sqd leader and PL.	1
I lost SA at the release pt. Of the platoon but squad was good.	1
Their was a problem with the radio for command and control use because my team leader was listening to the platoon net and squad net at the same time. I called in an enemy position, thought that he got it, but because of the platoon net he couldn't hear me.	1
Every Soldier should have the recon PDA. It is not heavy or bulky to carry but it gives the Soldier the basic situational awareness that he should have. Through-out my training as a rifleman I can remember sitting in my position looking at leaves and trees.	1
Killed by suicide bomber as soon as I hit the OBJ building C2.	1
I use the MFL but have a PDA and because of that I have to send a target to my squad and then it is sent to the PLT. Too many channels.	1

5. Using the scale below, please rate the degree of difficulty with TASKS WHILE ON MOUT OPERATIONS. Compare with how you would normally do it with the baseline equipment.

1 2 3 4 5 6 7



Much more difficult than Baseline — About the same as Baseline — Much easier than Baseline

	MEAN RESPONSE
Monitor GPS status of FFW system inside buildings	6.21
Monitor communications	6.65
Communicate in buildings	6.69
Monitor SA provided by FFW system	6.53

Comments	No. of Responses
I look at SA every now and then but commo was outstanding.	1
Didn't go inside any buildings.	1
I didn't have a chance to look into the GMD's inside the building because I died so fast.	1
Maps need to be able to be zoomed into 50-m grid squares in order to see location of squad members in buildings. Using imagery of MOUT environments is effective though.	1
No time to check on location once I was in the MOUT site.	1
It was handy to pull out the GMD and see where friendlies' progress was or where they were stationary.	1
It's fine in a MOUT environment except for the 5-minute refresh rate.	1
You lose GPS in buildings so you rely on SA.	1
We lose GPS inside of buildings but we keep commo.	1
GPS does not work in the buildings unless you are next to a window.	1

6. Using the scale below, please rate the degree of difficulty with TASKS WHILE ON NIGHT MISSIONS. Compare with how you would normally do it with the baseline equipment.

1 2 3 4 5 6 7

←==========→

Much more difficult than Baseline — About the same as Baseline — Much easier than Baseline

	MEAN RESPONSE
Use GMD and PVS-14 together	6.00
Use GMD and ENVG together	4.00
Use GMD while observing light discipline	5.00
Use PDA while observing light discipline	4.24
Use XM-104 under limited visibilty	NA

I had trouble using the GMD while at night because first GMD fogged up and the fan was on. Also too much light on the display and can't see out of the goggles while the ENVG's were on. Really should go back to the swivel on both the NODs (night observation devices) and display.	1
I cannot use the GMD and NVGs together. We are keeping them stowed in the pouch and pulling them out when we need them. We are also not using them as often as we should because of the effort having to be used to pull them out, giving up light discipline.	1
I barely use the GMD because I can't stand the goggle config. If it were smaller and not set in goggles I would probably use it all the time.	1
I don't use the PDA while in movement, or at the release point because of the light.	1
Day mission.	2
Again I wear the GMD's around my neck and tape the screen with electrical tape with a quick release so if I need to look through them I just peel the tape back and bring the GMD to my face.	1

Comments	No. of Responses
Although I don't carry the XM-104 I have been trained on it and I believe one of the best uses for it would be to mount it on a MK-19 or .50 cal or M240 and modify the ballistics in the XM-104 to allow you to use heavy weapons for plunging fire.	1
Light discipline once again is horrible something that can go over the eye would be preferable.	1

7. What was the most difficult aspect of this mission to accomplish using the FFW system?

Everything went very well.	1
Just the GMDs/SA. Couldn't find myself because of the voice and the bone conduction headsets were out on one side.	1
Finding my SA and keeping it moving or the center on me was not working for the past three days.	1
Just finding my SA and the voice command.	1
My voice command was inop and using the thumb drive.	1
Seeing the GMD. With the amount of precipitation in the air, the GMD fogged up worse than it ever has.	1
Contacting the FO (forward observer) to tell him that targets are being sent to FBCB2.	1
Determining who was who on the GMD because the rest of the platoon's icons do not say who is who.	1
Using the GMD at night, and not giving up light discipline.	1
Moving with all the weight, and holding the weapon up to look through the sight to engage enemy while moving or kneeling.	1
Communicating with other team members, especially when I saw enemy movement.	1
Moving upstairs with all the gear and more than one person in the stairwell.	1
Knowing where every one was, because it takes too long to update (5 min refresh). I see the icons but most of the time the people are already in a new location.	1
Getting in the prone and being able to scan your lanes.	1
Carrying the saw and trying to pull out and using the PDA.	1
The refresh rate at 5 minutes is way too long.	1
Trying to work in the packbot into the operation when we were the main effort.	1
The enemy locating us with our camouflage pattern.	1
Walking to the objective. The mission was not a difficult one to accomplish.	1
I didn't accomplish the mission. I was killed upon arrival at the objective.	1
Getting into position with the packbot.	1
The weight could be lighter.	3
I would have liked to use the GMD more often...but because of the rain, I used it more like as if was a PDA.	1
Wearing the GMDs (foggy).	1
My GMD whited out and at times was hard to identify my location.	1
The use of voice controls while moving and contact.	1
Having SA due to GMDs.	1

Comments	No. of Responses
Marking TGTS (targets) because once we dismounted I was engaging the enemy the entire time.	1
SA of the platoon.	1
Calling in enemy spot reports with too much radio traffic.	1
Briefing the OPORD. Especially for the Soldiers with the PDA the OPORD cannot be seen in detail so I would rather see it on a map or terrain model.	1
The most difficult was seeing SA when we were moving. The PDA can be pulled out and checked while moving but not on movement to contact. We got compromised in the ORP and moved straight onto the objective so I didn't have time to check the updated enemy.	1
Communication with radios once the gunfight started. Nobody could hear on the radio so we shouted to each other like we did without the radios.	1
Using the PDA while observing light discipline. I wanted to use my PDA in the objective rally point (ORP), but decided not to because I might give away our position.	1
Pulling out my PDA when it would of been useful to know where 2nd sqd was while we were in contact.	1
PDA and checking SA in the middle of a firefight. The execution phase was too fast for the use of the PDA.	1
Using the PDA during actions; its too much of a hassle and the screen is too bright in the night.	1

8. What was the easiest aspect of this mission to accomplish using the FFW system?

The planning.	5
Sending important things to FBCB2.	1
Routes and drawings.	3
Planning and route making are pretty much flawless with the FFW system.	
Communication.	7
Navigating and having the ability to at anytime while on the OBJ pull the GMD down, wipe it out and see where all friendly forces were.	1
Seeing where friendly units were once we did pull out the GMD.	4
Seeing where everyone was on the battlefield, and see how the fight is happening by listening to the radio and watching FalconView.	1
Using the GMD to know where the squad members were before I started shooting at enemy.	1
Knowing where the others were without being in sight of each other.	1
Being able to know exactly where my squad is at and able to talk to them with the radio.	2
Knowing the route and what was going on the whole time.	1
Going through brush.	1
Squad SA with each other.	1
Locating the enemy.	2

Comments	**No. of Responses**
Keeping SA and comms with the team/squad/platoon.	1
Wear and use of the FFW system.	1
Routes, movement, SA, knowing the positions of all friendly.	3
Land navigation.	1
Having SA of other squads.	1
Movement to the objective.	1
Seeing the layout of our defenses and setting sectors of fire.	1
Movement to release point.	1
Coordinating assaults. Our platoon was split up into three elements but each Soldier in our squad knew where each squad was because of SA provided by the FFW.	1
Moving around wearing the gear. It is about 10x better than the IBA, and the weight is about the same.	1
How comfortable the chassis is.	1
I didn't accomplish the mission. I was killed upon arrival.	1

9. What would you recommend to make the FFW system better?

I love the system.	1
Swivel on helmet on swivel NODs.	3
Make lighter.	7
More pockets on the chassis.	1
Instead of using the thumb drive just hit send and everything you send will hit FFW and FBCB2.	1
A different display.	1
Anything other than a GMD.	1
Get rid of GMD, FBCB2 icons identify who is who, an auto center feature in FalconView that works the same way FBCB2's do.	1
Mouse and push-to-talk buttons on the fore grip of the weapon, get rid of the GMD and have some other type of display, get rid of the wire between the MFL and the system (have them wireless), have the ability to dim the display from the mouse.	1
The headset makes an annoying clicking noise on the computer earpiece, I just pulled the cord out and didn't even use the voice commands.	1
Waterproofing is a must.	2
Get rid of GMDs.	1
Get rid of the goggles and have the screen easier to move out of the way.	2
XM-104 smaller, move the thermal so the front site post isn't in the way. Have the screen on a swing arm.	1
To be able to keep it down.	1
Maybe a PDA type system for leaders, or some other optic.	1
No goggles (try a small screen mounted to the helmet and slides down and up).	1
Once again I'm having to many problems with the GMDs so something like a helmet-mounted screen or something in that manner.	1
Refresh rate back to 30 seconds.	2

Comments	**No. of Responses**
Option of hearing both nets or either net individually.	1
More detailed maps. And communication between the PDA and FalconView.	1
Infrared screen for the PDA.	1
GMD change and mouse on the wpn.	1
GMD and FalconView for all members of the squad. We lost half the squad and I had no commo within the PLT or Company which were both needed.	1
PDA turned into some kind of a monocular.	1

10. Did any of the equipment you wore hinder your ability to complete the mission?

6 Yes 36 No

XM-104 made it hard to keep weapon up to aim through the sights.	1
The radio, hot miking and couldn't understand what other squad members were saying.	1
The computer system on the back made it hard to move with more than one person up the stairs.	1
The GMD needs to be more of a eye lens than goggles.	1
The leader systems seem like we have turtle shells on. I can lie down but it isn't comfortable.	1
The GMD needs to be more of a eye lens then goggles.	1
The turtle shell doesn't help matters when I need to move quickly out of a vehicle or get into the prone (position).	1
GMDs whited out.	1
GMDs.	1
Comfortable even with Packbot on my back.	1

11. Did you have any problems with fitting (donning and doffing) the FFW chassis?

1 Yes 41 No

Buddy system.	2
Chassis is much better than the IBA.	1
Very durable chassis. I carried a 75-lb packbot strapped to it and it held up nicely.	1
The chassis seems to wear differently when washed. It digs in and makes it uncomfortable.	1

12. Did you have any problems connecting the cables to power the FFW systems and radios?

0 Yes 41 No

13. Using the scale below, please compare the FFW system with your current (baseline) gear in terms of hindering or improving your ability to complete the mission

1 2 3 4 5 6 7

←==========→

Much more difficult than Baseline — About the same as Baseline — Much easier than Baseline

	MEAN RESPONSE
FFW versus Baseline	6.50

Appendix K. Future Force Warrior Experiment Phase: Defense Scenarios

SAMPLE SIZE = 9 (multiple iterations)

1. What was your specific mission today?

Comments	No. of Responses
Attack on McKenna.	7
Day attack on McKenna.	1
Night defense of McKenna.	2
Defend McKenna.	4
Defend McKenna village from SPF forces.	2
Day defense on Rockwell/blocking pos.	3
Block enemy on OBJ Rockwell from moving from the south to the north.	1
Blocking on Rockwell hill.	1
Defense of Rockwell Hill	
Defend the farp at McKenna.	1
Attack bomb making factory.	3
Take pictures of bomb making.	1
Locate bomb making facility in McKenna. Our squad was to be a faint on the west side of McKenna up to C-2.	1
Decoy in the west.	1
Defend and prevent enemy resupply.	1
Defense/offense pos.	1
Divert the enemy to the west side of McKenna. Enter clear buildings C1A-1B, and C2, then wait for further guidance.	1
Defend the east side/south east side of the McKenna mount from enemy attacks on police station of building C1. Also my Bravo team was to be used to re-enforce what ever sector need to be.	1
Day defensive/blocking position. Conducted at night. Our squad covered the East.	1
PLT main effort on the PLT Attack on McKenna C4 (clear quad 1 and 2)	1
Clear C-4 Quads 1 and 2 platoon ME.	1
Defend building C1 in order to restore police control in the area.	1
Our mission was to set up a blocking position to disrupt enemy resupply efforts in the area.	1
Attack on govt building to secure it and destroy all enemy personnel in order to restore order in the town.	2

2. Using the scale below, please rate the degree of difficulty with TASKS IN THE PLANNING PHASE of this mission. Compare with how you would normally do it with the baseline equipment.

1 2 3 4 5 6 7

Much more difficult than Baseline — About the same as Baseline — Much easier than Baseline

	MEAN RESPONSE
Route planning using the FFW system	6.71
Select and Mark TRPs with the FFW system	6.71
Select and mark RPs with the FFW system	6.73
Select and mark OBJ with the FFW system	6.79
Construct and brief the OPORD with the FFW system (SL and TL)	5.94
Conduct terrain analysis with the FFW system	5.97
Conduct map recon with the FFW system	6.57
Share overlays between FFW systems using thumb drives (memory sticks)	6.36
Understand the plan as seen on your GMD or PDA	6.23

Comments	**No. of Responses**
Terrain analysis worked great with FFW. I did the overlay for the squad by copying it from FBCB2 to the satellite image and passed it out to the rest of the leader systems. As soon as it was passed out we switched over to the topo map.	1
System wouldn't boot up; it was already up when I put it on before I left McKenna.	1
If FBCB2 would relate or send graphics to FalconView that way we don't have to program everything in itself from scratch of the screen itself or use the download data unto the memory stick and put it on the FFW system.	1
The rest of the platoon uses the FBCB2 and never gave us exact grids to be in (just general areas) with the system we have in the FFW. We need exact grids to be at because we have that capability.	1
GMDs kept cutting out.	2
Drawing a sector sketch would be much easier if the PDA had a drawing tool or could receive overlays from FalconView.	1
Terrain analysis was at an all-time low during this mission because we only had imagery. We needed to have a 1:50,000 maps. Once we got to our location we realized we needed to adjust our plan because of terrain but higher made us set in where they had.	1
PDA isn't really useful as of yet during the planning phase other than marking specific points. There is no route editor and the FFW system should be able to send routes to the PDA or the entire squad carries FFW with FalconView.	1
PDA doesn't have enough options to populate the mission.	1

Comments	No. of Responses
The PDA is limited so I won't go into that again. Terrain was a big one during this mission. We need more topographical maps for all of Benning that are able to zoom in a little more.	1
We also need a topical map.	1
PDA wasn't of much use during the mission; it was too quick to really check any SA.	1

3. Using the scale below, please rate the degree of difficulty with TASKS ENROUTE TO THE OBJECTIVE. Compare with how you would normally do it with the baseline equipment.

1 2 3 4 5 6 7

Much more difficult than Baseline — About the same as Baseline — Much easier than Baseline

	MEAN RESPONSE
Determine your location using the FFW system	6.65
Determine the location of other Squad members using the FFW system	6.32
Determine the location of friendly assets using the FFW system	6.18
Disseminate information using the FFW system	6.40
Issue FRAGOs using the FFW system (SL and TL)	6.06
Use the radio system for command and control	6.65
Land navigation using the FFW system	6.55
Use voice-activated controls during movement	5.40
Use voice-activated controls during contact with the enemy	5.33

Everything was on point today, even the voice commands/SA.	1
Never was lost and never felt like I'd get lost. It was very dense terrain and still had SA.	1
We have the capability to be whereever. Our pl/psg can give us grids.	1
SA for our squad was good but we did not have the rest of the platoon which created a problem because we couldn't see where they were on the GMD.	1
Didn't have any SA or anything; system wouldn't boot up.	1
My SA didn't occur but my squad had SA.	1
Couldn't get friendly or enemy SA.	1
Voice control was inoperable.	1
Don't like the 5-min refresh because the icon will stay still and my squad will move to different location, and the icon is wrong.	1
GMD was left up and only pulled out to determine current location because it fogs up so bad with the NODs on.	1
All the icons on FFW are good for SA, but the rest of the platoon's icons say FBCB2 and have a long IP address attached to them. All of that is taking up a lot of the map and covering space I would like to see.	1

Comments	No. of Responses
All icons on the FalconView program, if they are not FFW, have a long ISP address behind the FBCB2 which takes up a lot of the screen. If they could say something like TLA, or GR like the FFW icons it would take up a lot less space and would be a lot easier.	1
The computer makes a constant clicking sound in my ear and it gets annoying most of the time. I just pull the plug otherwise it becomes a distracter.	2
Didn't even plug in voice activation mic.	1
While in movement it is hard to use the PDA, but in an ORP it is a great tool for last minute SA.	1
Carrying all the equipment it takes us out of the fight and then you need a security team with the team that has to carry the gear.	1
Due to team leaders being able to hear platoon net it didn't allow me to communicate with my team during contact in our defense.	1
Lost SA of platoon once on OBJ just had squad.	1
Could not use anything except comms.	1
My SA went down once we reached Rockwell.	1
Spotting enemy op's is not easier than before but once they are spotted lasing them and sending that to the squad is easier.	1
PDA good for checking location but still very limited in comparison to the FalconView system. If the leadership goes down, a rifleman needs to be able to pick it up from there which would be very hard with the PDA. All need FalconView in my opinion.	1
PDA is good for SA but you must be at a stand still and it is horrible at night.	1

4. Using the scale below, please rate the degree of difficulty with TASKS WHILE ON THE OBJECTIVE. Compare with how you would normally do it with the baseline equipment.

1 2 3 4 5 6 7

←==========→

Much more difficult than Baseline — About the same as Baseline — Much easier than Baseline

	MEAN RESPONSE
Mark targets with the MFL	7.00
Send targets to squad members	6.60
Send targets to FBCB2	6.75
Send targets to Barebones	6.83
Send targets to XM-104	6.40
Conduct cooperative engagement between the Team Leader and Grenadier	6.00
Use SA provided by FFW system to determine the location of Soldiers	6.56
Use SA provided by FFW system to determine the location of friendly assets	6.48
Use SA provided by FFW system to mark enemy positions	6.24
Use radios for command and control	6.63

Comments	No. of Responses
SA and radios were on point for the mission; no problem at all.	1
My team leader and I tested the cooperative engagement before we went on the mission, seeing as they won't let us use 203's on the mission, it worked quite well.	1
It helps a lot because once we are set I can use the PDA to see what the rest of the platoon is doing and where they are located.	1
Radios were good within the FFW sqd but to other key leaders it wasn't.	1
My SA was slow due to the 5-min refresh. I think you should leave the 30-sec refresh in tact.	1
Did not use the MFL because of our mission and what happened on the mission. There was one time where I could have used it but didn't because the probability of the enemy coming from that location wasn't probable.	1
MFL was used first to mark the location of the pacbot. If you looked at the view in FalconView of FBCB2 and saw the gap that was left between our right flank and the next enemy, it was larger than I would have liked.	1
Each squads SA covered exactly where they were supposed to be on the overlay so when the enemy tried to infiltrate into our positions it was easy to see where other squads were going to move that were in reserve because everything was set in place.	1
Last night only our squad icons showed up, the rest of the platoon did not. We could tell where our guys were but were unable to use FFW to find the rest of the platoons locations.	1
Not allowed to use M203 so can't test cooperative engagement.	1
I was killed when we got to the building.	1
All the questions asked were not done during this mission, but the answers reflect the facts or opinion.	1
Once again SA was down.	1
Using FFW to know locations of friendly units is very easy. Knowing where the bad guys are is harder because even when lased or plotted the icon doesn't tell me enough information and sometimes I don't have time to click on it.	1
I cannot make sector sketches on my PDA. I can see my sector better using the map to see the guy to my right and left but I don't have a drawing tool to put the sketch on the map.	1
I carry the MFL with the PDA system. Sending to squad is too easy. But if I want to send to PLT or higher it has to go through a leader which is good but it still needs to be versatile to where I could send to PLT or the FO if leadership wasn't present.	1
Used MFL to laze target for FO but ran into a problem because I had to send it to my partner to send to FBCB2.	1
FFW is a recon tool through and through. We aren't used as a recon tool though. With the fatigues we wear and MFL's you could set out OP's of FFW and lase targets all day long for fires.	1

5. Using the scale below, please rate the degree of difficulty with TASKS WHILE ON MOUT OPERATIONS. Compare with how you would normally do it with the baseline equipment.

1 2 3 4 5 6 7

Much more difficult than Baseline — About the same as Baseline — Much easier than Baseline

	MEAN RESPONSE
Monitor GPS status of FFW system inside buildings	6.56
Monitor communications	6.60
Communicate in buildings	6.74
Monitor SA provided by FFW system	6.63

Comments	**No. of Responses**
With the PDA I've had no problems in the MOUT site.	1
The comms cut in and out between us and the platoon, between squad members it was good though.	1
It is a great tool when you have a moment to use it but in a fire fight you don't have time to pull it out. If it could be mounted on your arm, then it wouldn't be a problem.	1
Couldn't get GPS because system wouldn't boot.	1
It was hard to use the GMD at night because of fogging and the use of NODs.	2
Once you are not running around, the heat changes your view instantly.	1
Too much information being put out in on the radios. I'd rather have just squad net being a team leader.	1

6. Using the scale below, please rate the degree of difficulty with TASKS WHILE ON NIGHT MISSIONS. Compare with how you would normally do it with the baseline equipment.

1 2 3 4 5 6 7

Much more difficult than Baseline — About the same as Baseline — Much easier than Baseline

	MEAN RESPONSE
Use GMD and PVS-14 together	3.17
Use GMD and ENVG together	2.78
Use GMD while observing light discipline	4.46
Use PDA while observing light discipline	4.36
Use XM-104 under limited visibility	NA

Comments	**No. of Responses**
System wouldn't boot.	1
I don't like my eyes bogged up using the GMDs and the fan doesn't work sometimes even with a new battery. Like I said before, I think the swivel should be better.	1
Too much fog on goggles to see through the ENVGs and too much light on the goggle display.	1
Still fog up GMD's and had lot of scratches on goggles.	1
Not able to use the GMD and the ENVG's together because the GMD's fog up so bad after a short period of using them together. It is also difficult because you see a green circle on your ENVG eye and a bright white light in your firing eye.	1
The GMD needs much improvement. Having the video feed in the goggles has caused more and more problems for me. The weather has cooled down and now the goggles are more foggy and a problem to wear.	1
Due to fogging using NVG and GMD's is difficult.	1
When NODs were brought out to us, they didn't bring the swing arm so I couldn't wear them.	1
PDA too bright especially for any kind of recon mission. It is not feasible at night.	1

7. What was the most difficult aspect of this mission to accomplish using the FFW system?

Communication between squad. I have yet to have a problem with communication.	1
My system wouldn't boot up battery.	1
Just not using voice command; were not up.	1
Just the weight and carrying a lot of stuff so I can sit in the HMMWV a little bit better.	1
Voice command again didn't work, 5-min refresh was slowing things down for me like my SA on my squad. Didn't have SA on myself reboot the system twice.	1
Trying to get the SA from the rest of the platoon.	1
Pulling out the GMD while trying to observe light discipline.	1
Copying the overlay manually from FBCB2 to FalconView.	1
Figuring out where friendly units are.	2
Knowing all friendly location, routes, movement to the objective.	1
Use GMD to find the platoon.	1
Moving through the terrain.	1
Knowing where the others were without being in sight of each other.	1
In the prone, the system rides up on your body so it makes hard to scan your lanes.	1
Walking in a patrol and trying to look at the PDA, if it could be mounted on your forearm and load only the maps you need.	1
Networking the packbot with the FFW system.	1
Waiting for the fight to come to me instead of going to the fight.	1
Emplacing the technology.	1
I didn't accomplish the mission. I was killed upon arrival.	1
Weight, GMD with glasses(fog easy).	3
Setting in a position, the chassis is too bulky in the back.	1

Comments	No. of Responses
Now the GMD goggles have gotten to the point where I can wear them for about 3 minutes before fogging up.	2
Using GMDs while wearing NODs.	1
Making out what was what due to messed up GMD.	1
Having SA of other squads.	1
Knowing where the rest of the platoon was because their blue force trackers were not working.	1
I could not check enemy locations on my PDA once in the fight.	1
Terrain analysis. 1:50,000 scale maps with zoom capability to 50-m grid squares are needed.	1
Coordinating assaults. Our platoon was split up into three elements but each Soldier in our squad knew where each squad was because of SA provided by the FFW.	1
Light discipline using the PDA.	1

8. What was the easiest aspect of this mission to accomplish using the FFW system?

Planning, routes, SA.	6
Communication.	5
Graphics.	1
Screenless computer provided by them tl or squad leader.	1
Seeing where our squad was at all times.	5
Location of all friendly forces.	3
SA allowed us to see where friendly were and tie in with them so we could fill in the gaps as best as possible.	1
Following the fight and watching events happen in FalconView. I had a greater understanding of what was going on throughout the platoon by having the ability to hear that something was going on then watching elements move or confirm where friendly forces.	1
Land navigating and moving into position that was predetermined.	1
Get rid of GMD, FBCB2 icons identify who is who, an auto center feature in FalconView that works the same way FBCB2's do.	1
Lighter.	2
Accomplishing the mission.	1
Having constant SA of the battlefield .	1
No goggles (try a small screen mounted to the helmet and slides down and up).	1
Understanding the plan and phase lines.	1
Knowing where suspected enemy locations are. I received lots of SA on enemy locations from FBCB2.	3
Setting into our defense.	2

Comments	**No. of Responses**
Plotting enemy locations given by our robots and targets “lased” with the MFL.	1
Flexibility of the squad in the defense was greatly heightened because of these things.	1
GMD and FalconView for all members of the squad. We lost half the squad and I had no commo within the PLT or Company which were both needed.	1

9. What would you recommend to make the FFW system better?

Also have a tech around or somebody who capable of fixing problems right on the spot.	1
FalconView among the entire squad. FFW is a system where you need professional Soldiers who know their jobs and can pick up the job level above themselves. Therefore I think the entire squad should have the capabilities.	1
Swivel display instead of goggles. Also built in PVS-14 or ENVG’s built on the Kevlar.	2
Lighter equipment.	5
Weight configuration and eyepiece swivel same with NODs swivel that way. More SA, vision on the corner of the eyes.	1
30 sec refresh.	1
Back up voice command to find SA faster.	1
Different system besides the GMD.	2
A display that is not a goggle that can be moved out of the way easily and brought back in front of my eye just as easily.	1
Different viewer for the computer fold down or out-of-the-way viewer that is adjustable.	1
Fix the clicking in the one earpiece.	1
Better night capabilities for XM-104.	2
Make it easier to move out of the way.	1
The computer system on the back made it hard to move with more than 1 person up the stairs.	1
Something else for video feed other than goggles.	1
The turtle shell doesn’t help matters when I need to move quickly out of a vehicle or get into the prone.	1
Different display.	2
IR screen for the PDA.	1
I would change the way icons are labeled, and I would change the look of the icons so that there is more detail on what is reported and you don’t have to click on the icon to see what’s there.	1

10. Did any of the equipment you wore hinder your ability to complete the mission?

6 Yes 30 No

Comments	**No. of Responses**
Computer on the back.	1
Weight.	2
Cause we have to figure a way to work around certain things like the turtle shell in the back. It would of help to have a smaller system in the back of my vest so that I could sit better in my defensive position.	1
Have the SRW radio NOT attached to the helmet, so that I have comms with or without the helmet.	
GMD's kept whiting out.	1
GMD.	1
No SA.	1

11. Did you have any problems with fitting (donning and doffing) the FFW chassis?

2 Yes 34 No

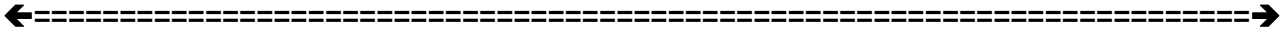
Just more pockets or pouches on the chassis itself.	1
The bottom retainer for the hook up of the chassis was broken.	1
I think that the constant taking the chassis on and off is moving and sliding a lot of the parts on it, such as pads and small straps. Some of them could be tightened down. It may make the chassis less adjustable, but it fits good as it is.	1

12. Did you have any problems connecting the cables to power the FFW systems and radios?

0 Yes 36 No

13. Using the scale below, please compare the FFW system with your current (baseline) gear in terms of hindering or improving your ability to complete the mission

1 2 3 4 5 6 7



Much more difficult than Baseline — About the same as Baseline — Much easier than Baseline

	MEAN RESPONSE
FFW versus Baseline	6.46

Appendix L. Future Force Warrior Experiment Phase: End of Assessment

SAMPLE SIZE = 9

PART I: UNIFORMS AND EQUIPMENT

1. Using the scale below, please rate each component of the FFW system in terms of making your tasks easier compared with the way you would normally conduct the tasks using currently issued baseline equipment.

1 2 3 4 5 6 7

←==========→

Much more difficult than Baseline — About the same as Baseline — Much easier than Baseline

	MEAN RESPONSE
Bone-conduction boom microphone	6.38
Bone-conduction headset	6.33
Push-to-talk device	6.00
Track-ball mouse	6.00
Stylus	6.00
Voice control input	5.20
GMD	4.83
PDA	6.20
FalconView application software	6.83
C2 MINCS application software	5.67
XM-104 fire control system	7.00
MFL	6.60
Thumb drive	6.20
Back pack computer	5.17
Controller for ground robot Packbot	6.25
Hydration system	6.78
Batteries	5.67
Ballistic belt	5.33

2. Did you have problems donning or doffing the FFW chassis?

_2_ Yes _7_ No

Comments	**No. of Responses**
With the exception of the weight, it was lot more comfortable than the IBA we use today, also easier to put on and take off.	1
The ballistic belt always came loose on me and didn't give any support. If it fit, it probably would have worked but mine was too big.	1
The bone-conduction headset just takes some getting used to.	1
The track ball mouse worked for the experiment, but I don't see it actually being fielded, especially when you have to take your hand off the weapon to use it.	1
The leader's system weighs too much.	1
The one part of the system that was most uncomfortable to me was the belt. It pinched and bruised my buttocks during movements and we weren't even moving that far. I prefer moving without it. The chassis itself had its good days and bad.	1

3. Did the FFW shirt fit properly?

9 Yes 0 No

I had a size too big at the beginning, but when I got my size everything fit perfectly and the elbow pads fell into place without my even strapping them down.	1
The shirt was very comfortable and helped me to stay cool easier. I don't normally wear elbow pads because they cut off circulation to my hands but I had no problem with these.	1

4. Did the FFW pants fit properly?

9 Yes 0 No

A little big but I just used that for extra room if I had to wear anything underneath. The pads still fell into place and I didn't have to strap anything down for it to stay in place.	1
When the strap for the knee pads is wrapped around my calves, it pulls the pants up slightly, not quite making them too short, but moving the bottom of the pants up my boot a little. The knee pads did not move and were more comfortable than what we use now.	1

5. What percent of the time did you wear the ballistic belt?

1 1-25% of the time
2 26-50% of the time
0 51-75% of the time
6 76-100% of the time

No comments.

6. Did the uniform come in adequate sizes to fit you?

6 Yes 2 No 1 NR

Comments	No. of Responses
Everything but the belt fit fine.	1
I would have worn the belt more if the sizing was able to get smaller. The belt was rubbing the pants, causing them to wear.	1

7. Were the knee pads comfortable?

9 Yes 0 No

No comments.

8. Did the knee pads stay in place?

8 Yes 1 No

I had two missions where I was moving around a lot and they were kind of hanging out; I noticed it before I lost them.	1

9. Were the elbow pads comfortable?

9 Yes 0 No

This style of elbow pads can and will make qualifying with your weapon more comfortable.	1

10. Did the elbow pads stay in place?

9 Yes 0 No

No comments.

11. Did the uniform and armor system provide adequate ventilation in hot weather?

9 Yes 0 No

Much better ventilation than the IBA. Moving or staying still, there was always a circulation of air moving around my body to cool me down. Also having the under-armor-type shirt built into the uniform is genius.	1

Comments	No. of Responses
The pants are a little warmer but I would still take them over what we are wearing now. They are a lot more durable.	1

12. Did the FFW uniform and armor system provide adequate insulation in cold weather?

8 Yes 1 No

Although in Georgia it doesn't get too cold but on a few nights, I put my black fleece on and it fit good underneath the chassis.	1
In cold weather all we had to do is add silk weight long sleeved shirts under the multi-cam shirt.	1
The wind seemed to cut right through it. Especially with the shirt we wear underneath with it being so thin and all the ventilation that the chassis offers.	1

13. Did you have problems accessing any of your equipment?

3 Yes 6 No

It was difficult to get to the GMD because of where it was located, especially when we were not wearing it all the time.	1
The PDA I always seemed to have a problem with. First it didn't fit in my pouch correctly and it was just awkward to get to. I ended up carrying it in my cargo pocket the entire time.	1

14. Was the stowage for ammunition adequate?

7 Yes 2 No

Just needed more big pouches for M4-mags only.	1
Just not enough extra space for other gear that I might carry because of the computer and all its accessories.	1

15. Was the access to stowed ammo adequate?

9 Yes 0 No

All ammunition was placed directly in the front of the vest.	1
I love the chest rig, as a rifleman and even more as a SAW gunner.	1

16. Did you have any problems donning or doffing the helmet?

0 Yes 9 No

No comments.

17. Did the helmet fit properly?

8 Yes 1 No

Comments	**No. of Responses**
When I put my NODs on the front I had the same problem I had with the ACH helmet, it weighs down the front and it is especially difficult to keep your head up without your helmet sliding down on your face when in the prone.	1
I've yet to wear a helmet that has fit and I have been completely comfortable in. Yes, it was more comfortable than the ACH we normally wear but I have worn one helmet in another experiment which was similar to the ACH set up with pads.	1

18. Did the helmet fit comfortably?

7 Yes 1 No 1 NR

However, I would like to see more padding in the helmet as the sweat band gives me a headache after wearing it for a while.	1
I don't know what the problem was. Every time I would wear the helmet, it would give me a headache from in the back of my skull or forehead. The helmet was not tight, it felt fine wearing it, but for some reason it would give me a headache.	1
Yes, but not as well as I'd like it to.	1

19. Was the helmet stable during missions?

9 Yes 0 No

No comments.

20. Was the heat build-up worse, about the same, or less than the FFW compared with your baseline helmet?

1 More heat than baseline
3 About the same as baseline
5 Less heat than baseline

Comments	**No. of Responses**
Just fine with helmet; no problems with anything.	1
I personally had no problem with the helmet giving off more heat than the ACH.	1
A lot more ventilation.	1
It was about the same as with the kpod or baseline helmet.	1
Seemed like there was lighter and more area for heat to escape.	1
There is space between the forehead and the helmet which allows the heat to come down out of the helmet on to my glasses, or onto the goggles for the guys that use goggles.	1

21. Was the FFW uniform ensemble more or less durable than the BDU or ACU?

0 Less durable 0 About the same 9 More durable

Awesome!	1
Blends in better with terrain.	2
The durability of the FFW uniform is a 100% improvement from BDU's and ACU's.	3
Much, much more durable. Even through the thick stuff I never caught a thorn.	1
The uniform's durability was one of the best things about the uniform. Another Soldier and I found ourselves kicking through Constantine wire and still didn't rip or tear the pants.	3

22. Was the camouflage pattern of the FFW uniform not as good as, about the same as, or better than the camo pattern on the ACU?

0 Not as good as ACU 0 About the same as ACU 9 Better than ACU

Blends in better in the woods and city than the ACU's.	1
Got 5 feet from the OpFor and they didn't see us until after we fired. With ACUs, you'll be seen a mile away.	1
Numerous amount of times we snuck within 10 ft of the enemies. I even lost my own guys a couple times it worked so well.	1
I'm telling you this uniform is way better in the field than ACUs. In fact, ACUs are nothing but a garrison uniform.	1
Its obvious; just look at them.	1
The camouflage pattern is 50x better than the ACU uniform. When stationary or on the move it is hard to pick out in the tree line. The squads behind ours had trouble following us because they would lose sight of us easily. We always knew where they were.	1
We were having problems seeing our guys when we would stop in the woodline, whereas anyone wearing ACU's was easy to spot. It is a far superior camouflage pattern than the ACU.	1

PART II: EQUIPMENT

23. Using the scale below, please rate the degree of difficulty you experienced conducting these individual movement techniques as compared with how you would normally do it with baseline equipment.

1 2 3 4 5 6 7

Much more difficult than Baseline — About the same as Baseline — Much easier than Baseline

	MEAN RESPONSE
Run	4.89
Crawl through tight areas	4.57
Run a zigzag pattern	5.00
Jump over small obstacles	4.78
Run up and down hills	4.89
Get in and out of foxholes	4.40
Low crawl	4.57
Combat roll	4.29
Short dash	5.22
High crawl	5.14
Kneeling firing position	5.78
Prone firing position	5.67
Other firing positions	5.67
High (4ft or higher) wall	4.60
Up and down ladder	4.63
Move through window (no glass)	4.67
Up and down steps	5.33
Move through small holes in wall	3.86
Run through doorways	5.22

24. Did any of the equipment you wore hinder your ability to complete the missions assigned during this experiment?

1 Yes 8 No

Comments	No. of Responses
The bulkiness of the vest never helped and the weight. I don't need the weight of a rucksack on my back while engaged with the enemy.	1

Comments	**No. of Responses**
Some of the weight was hindering because I had to jump through windows and high crawl which I had to be in mental and physical shape but if I wasn't I probably would have had some issues.	1
The big computer on our backs made it hard to crawl or move in tight spaces. The weight affected running.	1

25. Did you have any problems with any of the cables becoming entangled or causing you problems while moving over varied terrain?

2 Yes 7 No

But remember. The less wires there are, the better (always).	1
Had the GMD stowed and the cord got caught on a nail, took a second to get it off and I think it messed up the GMD.	1
I once got my arm stuck in the cables; not sure which ones but it took another person to get my arm out.	1

26. Was there anything you wanted to do with the FFW gear but could not because you weren't trained for it?

1 Yes 8 No

Take the GMD video feed out of the goggles and just use the eyepiece.	1

27. Listed below are the items attached to the chassis. Did each of the items fit well?

	Yes	**No**	**NR**
Hydration system	9	0	0
Load carrying system	9	0	0
Computer	7	1	1
Radio	9	0	0
Batteries	9	0	0
GMD	7	0	2
PDA	5	2	0

The chassis overall fit great and felt great. I'm taking in consideration that it is lighter now but it doesn't even feel like 70 lb on my back because it disperses the weight well.	1
Placement of items is up to the individual Soldier and the chassis provides plenty of space to move pieces around and personalize the gear to yourself.	1

Comments	**No. of Responses**
Everything fit all right and tight into place. However, there's not much room for anything else once all the extra gear (packbot) is networked in.	1
My GMD should be on my chest instead of on the side of the chassis; much better for me. Wish it could be wireless.	1
The computer either needs to be smaller or sit higher on the back, sitting low on the back like it is caused a lot of back pain.	1
Try not having a whole laptop on your back.	1
The GMD fit well, but I wouldn't want to have it on the battle field.	1

28. Listed below are the items attached to the chassis. Did you have easy access to each of the items?

	Yes	**No**	**NR**
Hydration system	9	0	0
Load carrying system	9	0	0
Computer	4	3	2
Radio	5	3	1
Batteries	4	3	2
GMD	6	1	2
PDA	5	2	2

All the items were easy to access, but while on your back, some of the items were inaccessible. You had to drop your gear or have a buddy help you out.	2
The PDA was excellent. Having it placed forward on my left hip was the perfect spot. I could pull it out and check my position and everyone's else's and stow the PDA in about 5 sec. I think the PDA is the answer to all the problems with the FBCB2 tablets.	1
As long as you aren't wearing it. If (you are) wearing it, it's hard to get to the stuff on your back and slightly difficult to get to things on the side but not too bad.	2
Now are you talking about while I'm wearing the chassis? If that's what you mean, some of my answers will change. But remember the buddy system still works.	1
PDA same as above. Hard to get to.	1

PART III: GMD and PDA DISPLAYS

29. Using the scale below, rate the ease of use of the input device(s) you used.

1	2	3	4	5	6	7
Extremely hard	Very hard	Hard	Neutral	Easy	Very easy	Extremely easy

	MEAN RESPONSE
Mouse	5.80
Voice	5.20
Stylus	6.00
Other	6.67

Comments	No. of Responses
The packbot was easy to use and network into my working gear/chassis.	1
PDA.	1
Sending points to way point editor and to bare bone, FalconView just to voice commands period when it's up and running.	1
The stylus was very easy to use but I would have liked a better place to store it on the PDA.	1

30. Using the scale below, indicate your level of agreement or disagreement with each of the following statements.

1	2	3	4	5	6	7
Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat Agree	Agree	Strongly agree

	MEAN RESPONSE
I had difficulty seeing all Blue (friendly) positions above my squad on the PDA	3.80
I had difficulty seeing my position on the PDA	2.00
I had difficulty seeing my squad's position on the PDA	1.75
I had difficulty seeing Red (OpFor) data on the PDA	4.25
I had difficulty using and understanding Red (OpFor) data on the PDA	4.25

31. Using the scale below, indicate your level of agreement or disagreement with each of the following statements:

1	2	3	4	5	6	7
Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat Agree	Agree	Strongly agree

	MEAN RESPONSE
I had difficulty seeing all Blue (friendly) positions above my squad on the GMD	2.20
I had difficulty seeing my position on the GMD	2.00
I had difficulty seeing my squad's position on the GMD	1.60
I had difficulty seeing Red (OpFor) data on the GMD	2.75
I had difficulty using and understanding Red (OpFor) data on the GMD	2.50

32. Did you have any problems seeing the icons on the GMD – were they large enough?

2 Yes 3 No 4 Did not use GMD

Comments	**No. of Responses**
My GMD was used for packbot.	1
The 5-min refresh came in effect at the last min and I was having some problems with my icons and before the 5-min refresh. I just had a couple of problems with my icon; just had to reboot the system twice.	1
They were large enough.	1
Yes, they are large enough. The only difficulty I was having was telling who was who, and when an enemy icon appeared telling what it was also. Usually we would find out by listening to the radio, but sometimes we weren't told what the icon was so.	1

33. Did you experience any glare on the screen of the GMD at any time?

3 Yes 3 No 3 Did not use GMD

At night it created difficulty.	1
At night when it was raining, experienced some glare especially when I had on the ENVGs. The glare was showing while I was trying to look through my ENVGs and I had to get used to that while on night mission.	1
Glare, no, but they do fog up too much.	1
Sweat got into the GMD and made my GMD video blurry for about a week until it got fixed. Also, the goggles stink. Not the GMD as a whole. I'm speaking about just the goggles. They fog up way too easy. Even more so at night once I am no longer moving.	1

34. Was the size of the GMD screen adequate?

6 Yes 0 No 3 Did not use GMD

Comments	**No. of Responses**
But the way it sits in the goggles, the upper portion of the screen is blocked.	1
They could have made it a just a little bit bigger because once you get up in age, your eyes start to go bad. So if the screen could be a little bit bigger for the old guys that are using this system it will be better for them and myself.	1

35. Was the stowage location of the GMD adequate?

4 Yes 2 No 3 Did not use GMD

Just wanted on my chest; that way it's easy to get to.	1
On the eighth mission I swear I reached muscle failure trying to get my GMD out of the pouch. I think it was because the Velcro[4] was sticking.	1
Stowage was all right, but the cables need to be more secure so that they don't break and come un-done from the goggles or connector.	1
When we didn't have it mounted all the time, it was difficult to get it back in the pouch or even to pull it out. At times we had another member of the squad stow them for us.	1

36. Was the GMD too heavy?

0 Yes 6 No 3 Did not use GMD

The only thing I didn't like about the GMD was I hate goggles, you don't have the fields of vision and they fog up way too quick.	1
The only weight no one can complain about.	1
The weight was about the same as the issued goggles.	1

37. Did you have any problems seeing the icons on the PDA – were they large enough?

1 Yes 6 No 2 Did not use PDA

I only used them in training.	1
The icons were good but I would have liked to have had a map that I could zoom in farther on to see better dispersion of the icons, such as seen in a 50-m grid square. Also, the icons could tell me more at a glance.	1

[4]Velcro is a registered trademark of Velcro USA, Inc.

38. Did you experience any glare on the screen of the PDA at any time?

3 Yes 4 No 2 Did not use PDA

Comments	**No. of Responses**
Horrible at night for obvious reasons. Light discipline. Still nice to have on you in case of crisis though.	1
At certain angles, glare made it hard to see exactly what you were seeing.	1

39. Was the size of the PDA screen adequate?

6 Yes 1 No 2 Did not use PDA

No comments.	1

40. Was the stowage location of the PDA adequate?

4 Yes 2 No 3 Did not use PDA

If the PDA is what is going to be used, then a special pouch for the PDA needs to be made. The same goes for anything that might replace the PDA.	1
Just wasn't where I would put it.	1
Most of the PDAs were worn in the cargo pocket.	1

41. Was the PDA too heavy?

0 Yes 7 No 2 Did not use PDA

No comments.

42. On the viewing device you used (GMD or PDA), how many levels of menus were available?

0 1 0 2 5 3 1 4 0 5 3 More than 5

43. What do you think of the levels of menus?

0 Too many 1 Not enough 8 About right

44. Were the most critical items on the first level of the menu?

8 Yes 1 No

Comments	**No. of Responses**
All grids that infantrymen use are in MGRS, the default on the PDA was lat/long. The default should be MGRS so that when I put in a target I can type in the MGRS grid or put in a direction and distance and it automatically plots the target.	1

45. Were the menu selections intuitive (you didn't have to think about them)?

9 Yes 0 No

No comments.

46. What would you recommend to improve the menu selections or the way they were presented to you?

I don't know; I didn't really pay too much attention to it.	1
I liked most of the menus as they are; they were not hard to figure out, except for the change that I typed above.	1
If the PDA is to be used later on, then have the PDA outfitted with FalconView.	1
Make voice command select things in menu instead of using your mouse and selecting what you want on the menu.	1
Not really menus but icons is a big one need more options and need to be able to label them however we want.	1

PART IV: SOFTWARE

47. Using the scale below, evaluate how easy and useful the FalconView software was for each task.

1 2 3 4 5 6 7

Not at all easy or useful — Neutral — Extremely easy and useful

	MEAN RESPONSE
Using SA map and Blue Force icons	6.86
Route planning	6.86
Adding targets to the SA Picture	6.86
Selecting targets to send to FBCB2	6.40
Accessing memory joggers	6.33
Overall use of FalconView	6.86

Comments	No. of Responses
Better than FBCB2. This system works outstandingly.	1
Did not use FalconView.	1
Excellent, just need a faster refresh rate like we had in the beginning.	1
If we were able to place other information that we use on a regular basis into the memory joggers, I would have used it a lot more, i.e., PCI checklists that we use for all our equipment.	1
Only through SGT Schake (team leader) could one of my points be sent to FBCB2. I did do it in training though and it was very easy.	1
The entire Army should go to FalconView. At least everyone in the platoon for the next experiment then maybe people would use their assets unlike the FBCB2 tablets.	1

48. How often did you send data to FBCB2 using the FalconView software?

3 Never	1 2-3 times per mission
3 Only in training	0 4-5 times per mission
2 1 time per mission	0 6 or more times per mission

49. Using the scale below, evaluate how easy and useful the C2 MINCS software was for each task.

1 2 3 4 5 6 7

Not at all easy or useful — Neutral — Extremely easy and useful

	MEAN RESPONSE
Using SA map and Blue Force icons	6.80
Adding targets to the SA Picture	6.80
Using the drawing feature	5.50
Accessing memory joggers	6.40
Overall use of C2 MINCS	6.20

Comments	No. of Responses
I used FalconView more because it had more features but C2 was very easy and fast to learn.	1
Plotting targets could be faster. When adding an entity, if I could put in a direction and distance to plot the icon or if I could type in an MGRS grid as soon as I plot it. Also, there was no drawing tool which I would have liked to have	1
While easy to use I feel that FalconView should replace C2 MINCS because it allows more with ease.	1

PART V: LASER DEVICES

50. Using the scale below, please rate your ability to complete each task while using the MFL. Compare each task to the use of your baseline – how you would normally do the task.

1	2	3	4	5	6	7
Extremely hard	Very hard	Hard	Neutral	Easy	Very easy	Extremely easy

	MEAN RESPONSE
Use the MFL controls	6.40
Acquire targets with the MFL	6.60
Hold the MFL on target	6.40
Transfer target data into the FFW system	6.80
Identify the targets placed on the FFW system by someone else	6.43
Identify the target location after it was placed on the FFW system	6.57

51. Did you have any problems transmitting or sharing MFL data with the squad?

1 Yes 3 No 4 Did not use MFL

Comments	No. of Responses
Outstanding. Lase and send. Too easy.	1
Used it in training only but it was very simple to learn and easy to use.	1
I only used it during training but I think every team leader and above in the Army needs one. A+!	1
It comes down to labeling. I carried the PDA with MFL and I could lase and mark my icon which sometimes made it difficult for the leadership to find the icon without using voice communication.	1
It would be easier to use the MFL if we could use the remote switch. Holding the MFL on target would also be easier with the use of bipod legs while in the prone.	1

52. Did you have any problems with the MFL during cooperative engagements?

2 Yes 2 No 4 Did not use MFL

A+ !	1
Never really got to try it out. I would send up a target during the missions and the XM-104 would have him pointing at his feet. I would have liked to have done a live fire with the system to actually see it work.	1
Occasionally we would have problems with the cables and would not be able to send targets from the MFL to FalconView.	1
This is training. Never could use it with the XM-104.	1

53. Did you have any problems getting data from the MFL to the FBCB2?

1 Yes 2 No 4 Did not use MFL

Comments	**No. of Responses**
Lase. Click, send to FBCB2. Very easy and fast.	1
Just because I was on the PDA. It is too easy to send to squad and then Schake would have to send them up for me.	1

54. Did you have any problem receiving data from the MFL?

1 Yes 6 No

Did not use.	1
It is difficult to set up initially but once it is set it is quite easy to use.	1
Populates quickly.	1
Sometimes when someone lazed a target they would have to resend it to squad a few times before I got it.	1

55. Did you understand the information you received from the MFL sufficiently to use the info to improve your situation?

6 Yes 1 No

Did not use.	1
Very easy. Very effective.	1
It was a great assist because I knew where friendly and enemy located and diff type of technologies place on the battlefield.	1
This MFL is a need for each squad to have in Iraq. Bottom line, if a squad can have two of these - great assist.	1
We finally got to really use us for what I perceive the FFW system being used for. Schake and I sat out about 200 m from the PLT defense like an OP. We over watched a large open area. We pre-lased targets and waited on sending them up to higher.	1

56. Using the scale below, please rate your ability to complete each task while using the XM-104. Compare each task to the use of your baseline – how you would normally do the task.

1	2	3	4	5	6	7
Extremely hard	Very hard	Hard	Neutral	Easy	Very easy	Extremely easy

	MEAN RESPONSE
Use the XM-104 controls	6.33
Acquire targets with the XM-104	6.33
Hold the XM-104 on target	6.00
Using data from other sources on the XM-104	6.67
Transfer target data into the FFW system	7.00
Identify the target location after it was placed on the FFW system	6.80
Identify the targets placed on the FFW system by someone else	6.80

57. Did you have any problems with the XM-104 during cooperative engagements?

1 Yes 2 No 5 Did not use XM-104

Comments	No. of Responses
If I was at a higher elevation the XM-104 told me to point straight down to hit the target, it only happened a few times during the entire test.	1
Only used the XM-104 briefly during training.	1
The XM-104 is something that would be great overseas in both Iraq and Afghanistan but not in the woods. We did not get a chance to use it very often.	1

58. Did you have any problems transmitting or sharing XM-104 data with the squad?

0 Yes 3 No 5 Did not use XM-104

No comments.

59. Did you have any problems getting data from the XM-104 to the FBCB2?

0 Yes 3 No 5 Did not use XM-104

I never sent data from the XM-104, only to it.	1

60. Did you have any problem receiving data from the XM-104?

0 Yes 7 No

Comments	No. of Responses
Did not use.	1

61. Did you understand the information you received from the XM-104 sufficiently to use the info to improve your situation?

3 Yes 2 No

Did not use XM-104.	1
It's easy to use with just a basic knowledge of how to use it and it took all the guess work out of firing an M203 round; it also freed me from having to compromise my position before firing it.	1

PART VI: BONE CONDUCTION SYSTEM

62.a. Check the choice that best describes your accent:

	No. of Responses
Standard American -- no accent	5
Midwestern	1
Western	1
Northeast/New England	0
Eastern seaboard	0
Southern	0
Foreign accent	0
None of the above	1

b. If foreign, which country?

NA.

63. How would you describe your speech speed?

0 Slow 8 Average 0 Fast

64. How would you describe your speech volume?

0 Soft 8 Average 0 Loud

65. Did you have any problems with using the voice-activated controls while in a static position?

3 Yes 5 No

Comments	No. of Responses
Did not use FalconView.	1
Didn't work sometimes and I was having problems with the voice six out of ten missions; had to reboot every time.	1
I chose not to use it. Only when plotting way points.	1
Towards the beginning of the experiment I didn't have any problems, but at the end of the experiment it was more of a burden to use it than not use it.	1
You had to say things slowly and somewhat loud; it was too picky on the accent for me to be able to use it all the time.	1

66. Did you have any problems with using the voice-activated controls during movement?

5 Yes 3 No

Comments	No. of Responses
Breathing hard or moving made it even harder for the computer to understand me.	1
Did not use FalconView.	1
Didn't work sometime.	1
It never understood me, probably because of my breathing; it was easier to just open manually.	1
Once you start breathing heavier, it is more difficult to use.	1
You have to control the mouse while in movement to use the voice control. I chose to just use the mouse then try to voice control.	1

67. Did you have any problems with using the voice-activated controls during contact with the enemy or while under stress?

3 Yes 4 No

Did not use FalconView.	1
Didn't work sometime.	1
If it wasn't recognizing my commands, I'd get mad and I don't know if I get more of an accent when I get mad but no matter what I said or how I said it the computer didn't recognize it (except computer shut up). Also the center on me command never worked.	1

68. Did you have any problems using the integrated communication system (both hearing and speaking)?

1 Yes 8 No

My comms were good the entire AAEF but sometimes understanding someone on the radio was hard because they were "eating" the microphone. I found that putting the microphone on your forehead you can be heard better than when it is in front of your mouth.	1
Speaking into the voice command on the way point editor would put different numbers into the grid and I had to start all over again and the center on me was killing me I had to find myself majority all the time.	1

69. Was the bone conduction headset and boom mike compatible with the helmet?

8 Yes 1 No

But I'd prefer the headset cause you're not always going to have your helmet on.	1
But next year have the radio apart from the helmet. Having to put on your helmet and plug in your wires stinks. Nobody is trying to wear the helmet all day.	1
I would rather have the headset detachable from the helmet; that way you can take off the helmet every so often and still be able to communicate with the squad.	1

70. Were other radios used by other squads able to communicate with your squad radios?

4 Yes 5 No

Comments	**No. of Responses**
On the platoon net yes, squad net no.	1
Sometimes during weather conditions and the trucks stable close to us for commo problems.	1
The comms net only squad internal communication. Only the squad and team leaders could communicate to other squads and platoon.	1
The platoon used the same radios.	1
Too much traffic.	1

71. Did other radios on site interfere with your communications?

1 Yes 8 No

PLT net.	1

72. Could you understand the radio transmissions sent to you?

8 Yes 1 No

But not my squad leader. Sounds bad.	1
Except when someone had the mike so close to their mouth it seemed like they were going to eat it.	1
Depends on how the person talking is speaking and his slur and how I hear it in the speakers.	1
Unless it was (a particular person).	2

73. Could other people understand your radio transmissions to them?

7 Yes 1 No

Same way my speech had to talk slowly and smoothly just where people come from.	1

74. Was the location of the radio on the FFW system accessible and convenient?

8 Yes 1 No

Comments	**No. of Responses**
I couldn't see it but I could reach it.	1
Only if you weren't wearing it at the time. If wearing the chassis the radio is on your back and you have to have someone else make adjustments for you.	1
The push to talk is all I need access to.	1
You'd like to monitor the net without wearing your helmet sometimes, having it built in is nice but you have to wear you helmet at all times to keep communication up.	1

PART VII: ALERTING SYSTEM

75. Did the FFW system have a system to alert you to pending danger or incoming communications?

4 Yes 5 No

Comments	No. of Responses
Beep! Beep!	1
Two dings.	1
If there is one on the radio then it was turned off before we got our systems.	1
Incoming communications - it chimed before someone started talking. There was nothing to tell us of incoming danger.	1
It had a dinging sound before somebody came on the radio and a buzz sound if you stepped on somebody's transmission.	1

76. Was the warning system adequate?

5 Yes 4 No

Sometimes it would chime while the person was talking, making it hard to hear whoever was talking.	1
There wasn't one.	1

77. Did the alerts give you sufficient time to react to the danger or message?

6 Yes 2 No

There was no warning tone.	1

78. Were the alerts understandable and intuitive?

6 Yes 2 No

There was no warning tone.	1

79. Were the alerts easily noticed?

6 Yes 2 No

There wasn't one.	1

80. Do you think a different type of alert system would be better, more timely, easier to understand?

4 Yes 3 No

81. What would you recommend to improve the alert system?

Comments	**No. of Responses**
A different tone in the bone conduction headset.	1
If everyone in the squad had a number and the number was said automatically to everyone when they keyed their radio, then it would be easier to know who is talking rather than trying to guess whose voice it was.	1
Unknown. I didn't have an alert system on my gear. If there was, it might have helped or hindered my SA.	1
When I would key in at the end of someone's transmission, it would key then I'd have to wait for those dings. By that time, someone's already talking. If they were reduced to just one it would be more adequate.	1

82. What type of alert system would you prefer?

1 Flashing icon
0 Flashing light in GMD or PDA
4 Voice
3 Tactile (e.g., pager or cell phone buzzer)
1 Other:

Flashing and voice.	2
Or voice would be OK. But remember to have two just in case you didn't receive it on one or the other.	1

83. Were the alerts adjustable to audio versus visual based on the mission or your situation?

1 Yes 6 No

No comments.

84. Did you have any problems with false alerts?

0 Yes 8 No

I think I misunderstood the question; I don't think it had an alert system for FFW, strictly comms.	1

PART VIII: MOUT OPERATION TASKS

85. Using the scale below, please rate the ease or difficulty of each task using the FFW system. Compare each task with the way you would normally conduct the tasks using the currently issued baseline equipment.

1 2 3 4 5 6 7

←==========→

Much more difficult than Baseline — About the same as Baseline — Much easier than Baseline

	MEAN RESPONSE
Monitor GPS status of FFW system inside buildings	6.38
Monitor communications	6.56
Communicate inside buildings	6.56
Monitor SA provide by the FFW system	6.56

Comments	No. of Responses
In a MOUT environment, it is even more useful to have a map that can zoom in farther than the maps that we had because the whole squad may be in one building.	1
Plt net with squad net stinks. One or the other.	1
Really I didn't look at SA but once or twice in MOUT because the blood is drilling and I'm pumped up and want to kill the enemy, but when I consolidate and reorganize, then I look at and monitor SA.	1
You lose GPS in buildings.	1
You don't get a chance to use it very often inside the buildings.	1

PART IX: NIGHT TASKS

86. Using the scale below, evaluate your agreement or disagreement with each of the following statements regarding completed tasks at night.

1	2	3	4	5	6	7
Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat Agree	Agree	Strongly agree

	MEAN RESPONSE
The GMD interfered with my ability to move cross country while wearing the helmet mounted PVS-14 or ENVG	5.00
The PDA interfered with my ability to move cross country while wearing the helmet mounted PVS-14 or ENVG	1.00
The GMD interfered with my ability to see the ground while moving cross country	4.60
The PDA interfered with my ability to see the ground while moving cross country	2.25

Comments	No. of Responses
Because the goggles fogged up, I stopped wearing the GMD and just pulled it out every once in a while. If it weren't a set of goggles, I'd use it all the time.	1
I just wore the GMD's around my neck because it fogged up too much with them on my head, even with the fans.	1
Don't like any; bogged down to my eyes. Should have a swivel, would be better. Have a dim light on the GMDs. Couldn't land nav with GMD and ENVG because of the fog and rather leave one piece on. Also hindered my ability to walk on the ground; had to take one.	1
It was too difficult to use the GMD and ENVG or PVS-14 together so the GMD was stowed and NVG's were used. I would pull the GMD out when I needed it. The issue I was having was at first I had a green circle in my left eye from the NVGS's and a white light.	1
No goggles. Try a different eyepiece.	1
The PDA's only consideration at night was light discipline because of the screen. A screen that could be read by NODs without lighting up the screen would be perfect and not as expensive as an infrared screen.	1

87. Did the GMD emit enough light to compromise your position at night?

1 Yes 7 No

Comments	No. of Responses
Did not use GMD.	1
Fine.	1
It was bright but only in the direction the screen was pointed.	1
Just placed electric tape over with a quick release.	1
The controls for adjusting light emission are on the back of the computer and difficult to get to while you are moving. I had to have another Soldier open the computer up and use a red lens flashlight to adjust it for me.	1

88. Did the PDA emit enough light to compromise your position at night?

5 Yes 1 No

I didn't have one but when someone pulled it out, it lit up the entire world with NODs on.	1
The light was a little too bright for night ops.	2
I would like a screen that could be read by NOD's without having to light it up a lot.	1
Like a little TV. Just not tactically but still nice to have just in case.	1

PART X: DAYLIGHT TASKS

89. Using the scale below, evaluate your agreement or disagreement with each of the following statements regarding completed tasks during daylight.

1	2	3	4	5	6	7
Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat Agree	Agree	Strongly agree

	MEAN RESPONSE
The GMD interfered with my ability to move cross country while wearing the helmet mounted PVS-14 or ENVG	4.83
The PDA interfered with my ability to move cross country while wearing the helmet mounted PVS-14 or ENVG	2.50

Comments	No. of Responses
GMD's interfered with peripheral.	1
No goggles. New eye piece.	1
No problems with PDA.	1

PART XI: SITUATIONAL AWARENESS

90. Using the scale below, please rate the ease or difficulty in maintaining Situational Awareness during these day and night missions. Compare each task with the way you would normally conduct the tasks using currently issued baseline equipment.

1 2 3 4 5 6 7

←==========→

Much more difficult than Baseline — About the same as Baseline — Much easier than Baseline

	MEAN RESPONSE
Know your own location	6.67
Know your team members' location	6.78
Know your squad's mission, even if it changed while moving to the objective	6.22
Communicate with other squad members	6.78
Know what the enemy is doing	5.75
Know the enemy's location	6.22
Predict what the enemy was about to do	5.89

91. Overall, did the FFW system interfere with your situational awareness, enhance your situational awareness, or have not effect on your situational awareness:

0 FFW interfered with SA
0 FFW had no effect on SA
9 FFW enhanced SA

92. How did FFW system add to or interfere with your situational awareness?

Comments	No. of Responses
Just different options FFW had to offer with my SA.	1
The FFW system definitely enhanced SA because instead of just hearing a report over the radio I could look at my PDA and see a picture of the battlefield which is better than trying to orient yourself to radio reports alone.	1
The FFW system helped me to understand where the enemy was coming from and where they were moving to.	2
The system gave us the ability to see where friendly and enemy were much easier. Instead of just getting that someone was at a grid I had the ability to just look into the GMD and see where they were.	1
You have to see yourself, see the terrain, and the enemy in a fight. This is actually the first time I could see not just where I am at, but the terrain around me.	1

PART XII: SUMMARY QUESTIONS

93. Did you need to adjust your standard operating procedures for radio communication for the FFW system?

1 Yes 8 No

Comments	No. of Responses
Personnel need to stay off the net unless they need to be on it, i.e., giving a spot report.	1

94. Which software assisted you most in planning for each of the following types of mission?

	FalconView	C2 MINCS
Ambush	8	1
Defense	8	1
Recon	8	1
MOUT Operations	8	1

Although I did not have a FalconView system, all planning was done on it and it worked very well. I would want to do the same on C2 MINCS or at least receive more info from FalconView.	1
Can't beat FalconView, it is the best of it's kind.	1
FalconView all the way. C2 MINCS is pretty much limited to where you are in relation to everyone else.	1
FalconView was used more cause it had more functions.	1
I don't believe there is really a need for the C2 MINCS program, especially when you have FalconView.	1
I was not part of planning.	1
I will take to theatre any time.	1
I don't care how high-tech this Army gets. When you set in a defense, you still need eyes on friendly and inner-locking fires. Otherwise, you have friendly cross fire like we did this whole mission.	1

95. How often did you share sector sketches using the FalconView software?

Did not use FalconView.	1
Few mission, three or four.	1
Here and there.	1
In training and that's it. I tried bringing it up in AAR's but we still didn't.	2
Mostly in the defense.	1
We really didn't use sector sketches.	1

96. Did you find using the flash drive to pass sector sketches to be easy?

3 Yes 2 No

Comments	No. of Responses
It would be easier to just send them over the net. To use the thumb drive I have to walk it over to who needs it which may cause me to leave my squad's sector or someone else to have to come to mine.	1
Used flash drive to share overlays not so much sector sketches.	1
Used it for routes and it was faster and a lot easier to do and understand than making a terrain model or going through it on a map.	1
Wish I could send to whole squad instead of using flash drive.	1

97. What was the most difficult aspect of these missions to accomplish using the FFW system?

Just physical obstacles like running, climbing through windows, and jumping over things. Those problems will go away as the system gets smaller and lighter.	1
Just the voice command and the 5-min refresh button.	1
Nothing proved to be real difficult during the missions in comparison to what is normally done in missions.	1
Nothing. It was our leadership's plan of execution. Spreading out the platoon too far and away from each other like we are a company. We seldom did a mission like a real platoon.	1
Observing light discipline with the PDA during night missions. Also, when SA went down on any mission it made the mission harder. If SA goes down I would like the FFW system to work like a regular GPS so that I know my position at all times.	1
Trying to pull out the PDA while in movement.	1
Using the GMD.	1
Wearing the GMD's at night with PVS-14's.	1

98. What was the easiest aspect of these missions to accomplish using the FFW system?

The system was very good at giving up-to-minute SA on the ground.	1
Knowing where everyone was and being able to track and sneak up on the enemy (camouflage pattern and using reports from everyone else to track his location).	1
Movement was definitely the easiest aspect because of the radio. I didn't have to have constant eyes on my team leader while moving to get hand and arms signals which enabled the squad to have better dispersion.	1
Planning and land navigation.	1
Planning the routes and sectors and drawing sending stuff to FBCB2.	1
SA.	1

Comments	**No. of Responses**
Seeing where everyone was once I did pull the GMD out of the pouch. If it wasn't a set of goggles I would have used it a lot more than we did. I will say this though, that we used the GMD a lot more than the rest of the platoon that used the FBCB2 tablet.	1
Third squad had the system. The rest of the platoon didn't. They could care less what input we had or have.	1

99. Is there any function currently on the FFW system that you would recommend be deleted?

C2 MINCS.	1
No.	4
C2 MINCS needs to be more compatible with FalconView. Overlays sent to C2 MINCS, etc.	1

100. Can you think of any functions that you would like to see added to the FFW system?

A digital camera that is not mounted on the weapon unless you are using it for recon. If it is being used for a recon mission, then it would be fine mounted on the weapon. The camera gets rid of us having to tote around a 75-lb robot.	1
Back up voice command system.	1
FalconView on the PDA.	1
I would like to see everyone in the squad have an MFL. I think it would be a very good way to give a spot report without having to give distance and direction on the radio which can sometimes be confusing.	1
No goggles, new eye piece.	1

101. Do you have any other recommendations to make the FFW system better?

FalconView on the PDA.	1
New eye piece, no goggles. The leader systems weigh too much!!!	1
Other than replace the GMD's and mouse with a weapon-mounted one, NO.	1
Ruggedize all components and test them in the desert before equipping a force to use them in the desert. My personal GPS that I used in Afghanistan was tough but still took a beating because of the sand. Also, SA should be as reliable as my GPS was.	1
Some stuff wireless and swivel on helmet, also swivel put on for NODs.	1
Speed up refresh rate, smaller and lighter, less cords.	1
To make the PDA on your forearm.	1

102. For each of the FFW components listed below, describe at least one GOOD feature?

a. FFW chassis:

Air circulation between the chassis and your body.	1

Comments	**No. of Responses**
Comfortable.	3
Good ventilation.	5
Doesn't feel like your carrying the weight you are. It feels lighter.	2
It was really good at dispersing the weight of your load on your back.	1
Fits your body good.	1
More movement allowed with the arms.	1
Being able to put it on and take it off without having to readjust it all the time to keep it closed.	3
More range of motion, easier to run with, better storage of ammo on the chest rig. Camelback is attached to it on the side so a pack can still be worn. On a scale of 1 to 10, I give the FFW chassis a 10 and the IBA a -1.	1
Where your pouches were mounted.	1
b. FFW ballistic belt:	
Don't like, but others in the squad do. I think it is a preference thing.	1
Helps with weight of body armor.	2
Held up the chassis pretty good; takes a lot off your back.	2
Makes the chassis more comfortable and gives me more room for other pouches to carry extra equipment.	1
Held my first aid pouch.	1
You can attach more things that the vest can't hold.	1
My belt was too big so it wore on my pants and started to wear them out. So I stopped using it.	1
c. FFW helmet:	
Breathes better.	1
Straps are better; don't come loose easily.	1
It is comfortable.	2
The top part of the chin strap sits higher and the bottom one sits lower, making it more comfortable on the chin and holds it on better.	2
Just right for your head when fitted right.	1
The helmet wears great and sits on your head nicely as to not cause discomfort.	1
Light.	3
d. FFW bone conducting microphone:	
Can put it on your forehead and still be heard clearly, keeping the mike out of the way of seeing left or right.	1
Comfortable because it is built into the helmet.	1
Flexible.	1

Comments	**No. of Responses**
It can be used tactically and I can place it where I want and I can still send good transmissions on the radio.	1
It is easy to move out of the way and stays in place.	1
It worked well at sending information.	1
It's just about hands free.	1
Push to talk.	1
Very clear when I was communicating.	1

e. FFW bone conducting headset:

It allowed for hearing the net and nearby sounds simultaneously.	1
Kept out of the ears being able to hear people talking next to you and through the headset at the same time.	1
Push to talk.	1
Sits right at my temple.	1
There is nothing in my ear or blocking my ear allowing me to hear more of what is around me.	2
Very clear.	1

f. FFW hydration system:

Great.	1
More durable.	3
Bladder seems to be a lot more durable.	2
Doesn't get in the way.	1
It was easy to use and fill.	1
It worked just like any other hydration system.	1
Nice almost seems like part of the chassis.	1

g. FFW load carrying capability:

I love the chest rig for carrying ammo. It works in any position.	1
It can use a little improvement but not much. It is pretty good.	1
Like the pouches.	2
Much better place.	1
There is room for plenty of pouches, unfortunately we had to put batteries.	1
Its all on the front, but there does need to be more space for other gear.	1
Too heavy, but (I) got used to the weight.	1

h. FFW computer:

Did not carry computer.	1

Comments	**No. of Responses**
Easy to learn and durable.	1
It allows for quick and easy SA.	1
Love the video feed.	1
The abilities it gives us increases our survivability and lethality.	1
The software, but it does need to be smaller, lighter, and sit higher on the back.	1
Too big but got used to it.	1

i. FFW radio:

Can hear everyone clearly when it works and the person talking isn't eating the mike.	1
Easy to use.	2
Fast.	1
Just right.	1
Push to talk.	1
Some information can be sent over the radio.	1
The FFW radio helps with SA.	1
You can talk to every one in the squad.	1

j. FFW batteries:

Good places to put them.	1
Lifetime.	1
Long lasting.	1
The PDA batteries are easy to change (a little more difficult at night).	1
They were standard 2590 batteries.	1
Could be smaller.	1

k. FFW GMD or PDA (state which one you used):

GMD has great video feed.	1
Good concept for the GMD.	1
Good SA.	4
Very clear.	1
Didn't like the goggle.	1
The screen needs to be set on something other than goggles, like a swing arm mounted on the helmet or something.	1

l. FFW manual controlling device for GMD or PDA (mouse or stylus):

Gave me the capability to easily access anything.	1
Good mouse.	2
The trackball was easy to use.	1

Comments	**No. of Responses**
The GMD is easier to use than the FBCB2 tablet and a lot more handy.	1
The PDA stylus is easy to use and I think better than using a mouse.	1
The stylus was very simple to use.	1

m. FFW voice-activated control devices:

Did not use.	1
Great when putting in grids.	1
I only used it during training, and it worked well.	1
If we could get them to work all of the time it would save a lot of time and make using the system much easier.	1
Just worked sometime, but was on point when working.	1
Time saving.	1
Didn't have to find the mouse or the commands on the computer just had to say them. But they need to be more sensitive and recognize different voices/accents.	1

103. For each of the FFW components listed below, describe at least one BAD feature?

a. FFW chassis:

A lot of moving parts that start to become loose after using it everyday for a while. I think a few less adjustable pieces would be OK.	1
Could be a little lighter.	4
If the pads are too big they start to fold in on itself.	1

b. FFW ballistic belt:

It needs more sizes.	1
It pinches the nerve in your leg while sitting.	1
It was too big and started to wear my pants down.	1
More weight.	1
Need to tighten up just a little tab.	1
When I cinch down the straps they don't stay so I have to tie a knot in them. There should be some way of keeping it tied down.	1

c. FFW helmet:

Gave me headaches.	1
I don't like the sweat band and would like to see more padding in it. And the heat that comes out of the helmet should be expelled somewhere other than my face because it fogs up my glasses and NODs.	1

Comments	**No. of Responses**
d. FFW bone conducting mike:	
It worked well.	1
I like it.	
All in my face.	1
e. FFW bone conducting headset:	
It worked well.	1
Hated the fact it was attached to the helmet.	1
I'd rather have a headset.	1
It squeezes my head after wearing it for a few hours.	1
It takes time to get used to having them sit up against your temples.	1
f. FFW hydration system:	
It worked well.	1
I like it.	1
g. FFW load carrying capability:	
I like it.	1
It could be improved a little to be able to carry more personal items.	1
Not enough space.	1
Too heavy.	1
h. FFW computer:	
Did not use.	1
Heavy and bulky.	4
Too heavy for continued use	1
Its on my back.	1
i. FFW radio:	
Needs separate company and platoon net.	1
Not waterproof.	1
Out of the helmet.	1
The radio should have a few more nets, such as privacy nets for people such as attachments to a squad should be able to talk directly to the squad leader that they are attached to without talking to the whole squad.	1
Too big.	1
j. FFW batteries:	

Comments	**No. of Responses**
Big.	3
Heavy and took up space.	1
I would like to use lithium batteries which I think will last longer.	1

k. FFW GMD or PDA (state which one you used):

Fogs up way to much.	3
Goggles fog up to quick, can't see part of the screen the way it sits.	
It is a pair of goggles; the only time I wear goggles is in the back of truck, I prefer glasses.	2
The glare could get bad.	1
PDA; it puts off too much light at night.	1
The PDA has a problem with light discipline at night and changing batteries is somewhat difficult at night. The cables need to be ruggedized so they can't be pulled out by branches.	1

l. FFW manual controlling device for GMD or PDA (mouse or stylus):

Mouse is not rugged enough and the one that was made for the system does not allow you to use all of the features of the system.	1
Need to have a hold button because of the mouse so sensitive.	1
Needs to be weapon mounted.	1
The stylus needs a better place to store it on the PDA.	1
The trackball; all the buttons would get pressed and when I'd look at the GMD, I'd have menu's that I didn't need open.	1

m. FFW voice-activated control devices:

Only used them in training and it worked well for me.	1
Did not use.	1
Have to move mouse around.	1
It didn't work all the time towards the end of the experiment. Its accuracy decreased.	1
Just didn't work sometimes; need a back up plan.	1
Not sensitive enough, and doesn't recognize enough voice styles (soft to loud) or accents.	1

104. Using the scale below, compare the FFW system against your baseline equipment based on your overall experience. Did the FFW make it more difficult or easier to complete these missions?

1	2	3	4	5	6	7
←==========→						
Much more difficult than Baseline			About the same as Baseline			Much easier than Baseline

	MEAN RESPONSE
FFW versus Baseline	6.56

NO. OF COPIES ORGANIZATION

1 (PDF ONLY) DEFENSE TECHNICAL INFORMATION CTR
DTIC OCA
8725 JOHN J KINGMAN RD
STE 0944
FORT BELVOIR VA 22060-6218

1 US ARMY RSRCH DEV AND ENGRG CMD
SYSTEMS OF SYSTEMS INTEGRATION
AMSRD SS T
6000 6TH ST STE 100
FORT BELVOIR VA 22060-5608

1 DIRECTOR
US ARMY RESEARCH LAB
IMNE ALC IMS
2800 POWDER MILL RD
ADELPHI MD 20783-1197

1 DIRECTOR
US ARMY RESEARCH LAB
AMSRD ARL CI OK TL
2800 POWDER MILL RD
ADELPHI MD 20783-1197

2 DIRECTOR
US ARMY RESEARCH LAB
AMSRD ARL CS OK T
2800 POWDER MILL RD
ADELPHI MD 20783-1197

1 ARMY RSCH LABORATORY - HRED
ATTN AMSRD ARL HR M DR M STRUB
6359 WALKER LANE SUITE 100
ALEXANDRIA VA 22310

1 ARMY RSCH LABORATORY - HRED
ATTN AMSRD ARL HR ML J MARTIN
MYER CENTER RM 2D311
FT MONMOUTH NJ 07703-5601

1 ARMY RSCH LABORATORY - HRED
ATTN AMSRD ARL HR MZ A DAVISON
199 E 4TH ST STE C TECH PARK BLDG 2
FT LEONARD WOOD MO 65473-1949

1 ARMY RSCH LABORATORY - HRED
ATTN AMSRD ARL HR MD T COOK
BLDG 5400 RM C242
REDSTONE ARSENAL AL 35898-7290

NO. OF COPIES ORGANIZATION

1 COMMANDANT USAADASCH
ATTN AMSRD ARL HR ME A MARES
5800 CARTER RD
FT BLISS TX 79916-3802

1 ARMY RSCH LABORATORY - HRED
ATTN AMSRD ARL HR MO J MINNINGER
BLDG 5400 RM C242
REDSTONE ARSENAL AL 35898-7290

1 ARMY RSCH LABORATORY - HRED
ATTN AMSRD ARL HR MM DR V RICE-BERG
BLDG 4011 RM 217
1750 GREELEY RD
FT SAM HOUSTON TX 78234-5094

1 ARMY RSCH LABORATORY - HRED
ATTN AMSRD ARL HR MG R SPINE
BUILDING 333
PICATINNY ARSENAL NJ 07806-5000

1 ARL HRED ARMC FLD ELMT
ATTN AMSRD ARL HR MH C BURNS
BLDG 1467B ROOM 336
THIRD AVENUE
FT KNOX KY 40121

1 ARMY RSCH LABORATORY - HRED
AVNC FIELD ELEMENT
ATTN AMSRD ARL HR MJ D DURBIN
BLDG 4506 (DCD) RM 107
FT RUCKER AL 36362-5000

1 ARMY RSCH LABORATORY - HRED
ATTN AMSRD ARL HR MK MR J REINHART
10125 KINGMAN RD
FT BELVOIR VA 22060-5828

1 ARMY RSCH LABORATORY - HRED
ATTN AMSRD ARL HR MV HQ USAOTC
S MIDDLEBROOKS
91012 STATION AVE ROOM 348
FT HOOD TX 76544-5073

1 ARMY RSCH LABORATORY - HRED
ATTN AMSRD ARL HR MY M BARNES
2520 HEALY AVE STE 1172 BLDG 51005
FT HUACHUCA AZ 85613-7069

1 ARMY RSCH LABORATORY - HRED
ATTN AMSRD ARL HR MP D UNGVARSKY
BATTLE CMD BATTLE LAB
415 SHERMAN AVE UNIT 3
FT LEAVENWORTH KS 66027-2326

NO. OF
COPIES ORGANIZATION

1 ARMY RSCH LABORATORY - HRED
ATTN AMSRD ARL HR MJK J HANSBERGER
JFCOM JOINT EXPERIMENTATION J9
JOINT FUTURES LAB
115 LAKEVIEW PARKWAY SUITE B
SUFFOLK VA 23435

1 ARMY RSCH LABORATORY - HRED
ATTN AMSRD ARL HR MQ M R FLETCHER
US ARMY SBCCOM NATICK SOLDIER CTR
AMSRD NSC SS E BLDG 3 RM 341
NATICK MA 01760-5020

1 ARMY RSCH LABORATORY - HRED
ATTN AMSRD ARL HR MY DR J CHEN
12423 RESEARCH PARKWAY
ORLANDO FL 32826

1 ARMY RSCH LABORATORY - HRED
ATTN AMSRD ARL HR MS MR C MANASCO
SIGNAL TOWERS 118 MORAN HALL
FORT GORDON GA 30905-5233

1 ARMY RSCH LABORATORY - HRED
ATTN AMSRD ARL HR MU M SINGAPORE
6501 E 11 MILE RD MAIL STOP 284
BLDG 200A 2ND FL RM 2104
WARREN MI 48397-5000

1 ARMY RSCH LABORATORY - HRED
ATTN AMSRD ARL HR MF MR C HERNANDEZ
BLDG 3040 RM 220
FORT SILL OK 73503-5600

10 ARMY RSCH LABORATORY - HRED
ATTN AMSRD ARL HR MW D TURNER
BLDG 4 ROOM 332
FT BENNING GA 31905-5400

1 ARMY RSCH LABORATORY - HRED
ATTN AMSRD ARL HR MN R SPENCER
DCSFDI HF
HQ USASOC BLDG E2929
FORT BRAGG NC 28310-5000

1 ARMY G1
ATTN DAPE MR B KNAPP
300 ARMY PENTAGON ROOM 2C489
WASHINGTON DC 20310-0300

NO. OF
COPIES ORGANIZATION

5 US ARMY SOLDIER SYS CMD
NATICK SOLDIER CENTER
FFW TPO AMSRD NSC W C BLACKWELL
15 KANSAS STREET
NATICK MA 01760

ABERDEEN PROVING GROUND

1 DIRECTOR
US ARMY RSCH LABORATORY
ATTN AMSRD ARL CI OK TECH LIB
BLDG 4600

1 DIRECTOR
US ARMY RSCH LABORATORY
ATTN AMSRD ARL CI OK TP S FOPPIANO
BLDG 459

1 DIRECTOR
US ARMY RSCH LABORATORY
ATTN AMSRD ARL HR MR
F PARAGALLO
BLDG 459